PO-RALG

MVOMERO DISTRICT COUNCIL

PHYSICS MOCK EXAMINATION

MARKING SCHEME MAY 2023

FORM IV

SECTION A (15 MARKS)

1. (1 MARK @) = 10 marks

i	ii	iii	iv	v	vi	vii	viii	ix	x
C	E	A	A	B	E	B	A	C	A

2. (1 MARK @) = 05 marks

i	ii	iii	iv	v
D	H	B	E	G

SECTION B (60 MARKS)

3. (a) (i) The student got the problem of nose bleeding due to high blood pressure at high altitude compared to atmospheric pressure. **(02 Marks**)

(ii) Astronauts wear space suits in order to maintain this pressure **(02 marks)**

(b) **Solution**

Data

Weight =24500 N **0.5 marks**

Gravity (g) = 10 N/Kg

(i) From

Weight = mg **0.5 marks**

Therefore,

$M = \frac{w}{g}$ **0.5 marks**

$= \frac{24500\ N}{10\ /kg}$ **0.5 marks**

=2450 kg

The mass of the spacecraft is 2450 Kg. **01 marks**

(ii) The acceleration due to gravity on Jupiter's surface in 2.6 times that on earth.

Therefore, g on Jupiter = 10 N/kg × 2.6 = 26 N/kg. **0.5 marks**

From , w=mg 0.5 **marks**

M=2450 kg and g= 26 N/kg **0.5 marks**

Therefore,

W= 2450 kg × 26 N/kg **0.5 marks**

= 63700 N.

The weight of spacecraft on Jupiter is 63700 N. **01 marks**

4. (a) **Solution**

Given, incident angle (i) = 30°; angle of refraction (r) = 22°, refractive index (ŋ) = ? **01 marks**

From,

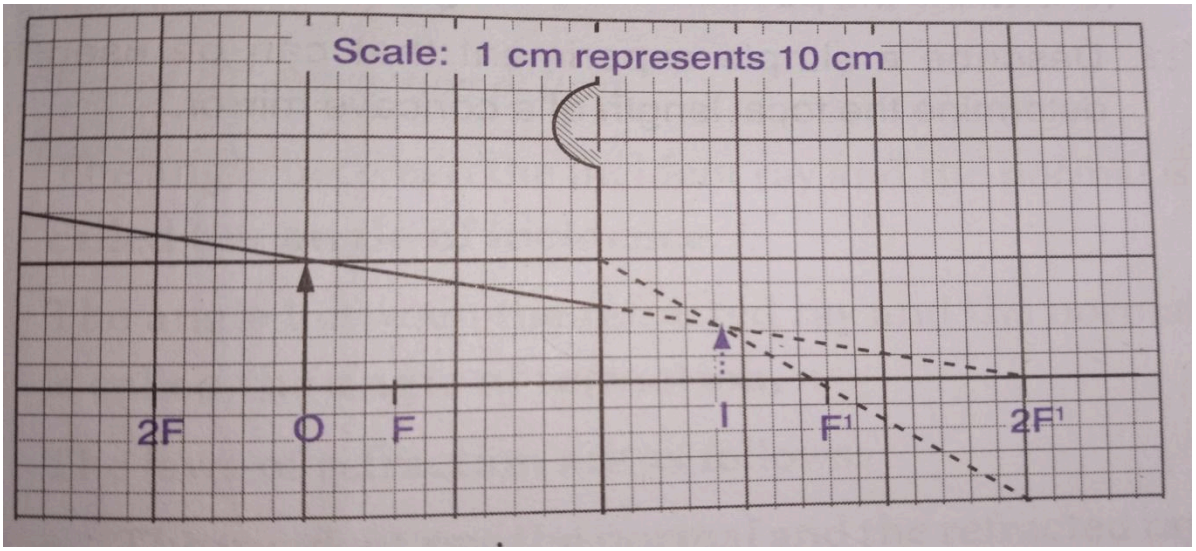
$\eta = \frac{\sin i}{\sin r} = \frac{\sin 30°}{\sin 22°}$ **02 marks**

= 1.33

Therefore, the refractive index of the medium is 1.33. **01 marks**

(b) **Solution**

Diagram (03 marks)



(i) Image distance = 0.8 cm × 10 = 8 cm. **01 marks**

(ii) Image height = 0.4 cm × 10 = 4 cm. **01 marks**

(iii) Magnification = $\frac{4\text{ cm}}{10\text{ cm}}$ =0.4 or $\frac{v}{u} = \frac{8\text{ cm}}{20\text{ cm}}$ = 0.4 **01 marks**

5 (a) (i) **Specific heat capacity** is the quantity of heat required to raise the temperature of 1 kg of a substance by 1 C or 1 K. **01 marks**

-**Specific latent heat of vaporization** is the quantity of heat required to convert unit mass of a substance from liquid to vapour state without change of temperature. **01 marks**

(ii) -Temperature, Atmospheric pressure and Vapour pressure of the liquid **03 marks, 1 mark @**

(b) Solution

m_i = 800 g m_f = ? **01 marks**

$n = \frac{40\ days}{8\ days} = 5$ **01 marks**

$m_f = \frac{mi}{2^n} = \frac{800\text{ g}}{2^5}$ **01 marks**

$= \frac{800\text{ g}}{} = 25\text{g}$ **01 marks**

32

= **25 g** of the 800 g initial sample will remain undecayed after 40 days. **01 marks**

6. (a) (i) Newton's first law of motion. **01 marks**

(ii) Newton's first law of motion states that "A body will continue to be in its state of rest or uniform motion unless an external force acts on it. **02 marks**

(b) (i) **Solution**

Efficiency = $\frac{M.A}{V.R} \times 100\%$ **0.5 marks**

But

M.A = $\frac{Load}{Effort}$ **0.5 marks**

$=\frac{750\ N}{30\ N} = 25$ **01 marks**

V.R = $\frac{circumference\ of\ a\ circle}{pitch}$ **0.5 marks**

$= \frac{2\times 3.14 \times 1\ 6cm}{0.\ 5\ cm} = 201$ **0.5 marks**

Therefore, efficiency = $\frac{25}{201} \times 100\ \%$ **0.5marks**

= 12.4 %

The efficiency of the machine is 12.4 % **0.5 marks**

7. (a) (i) Both consists convex lens which focus on inverted image. In camera focused onto film while human eye focused on retina (2 marks).

(ii) Both adjust the quantity of light entering. In camera it's done with aperture while in human eye its done with iris (2 marks).

(iii) Both capture the image through an important element, retina for human eyes and film in a camera (2 marks).

(b) (i) Conduction of heat is the process by which heat energies is transmitted through collisions between neighboring atoms or molecules**. 02 marks**

(ii) Applications of conduction of heat in our daily life. **01@ = 05 marks**

-Cooking vessels are made of metal to transfer heat quickly

- An insulator blocks the transfer of heat. Eg. Handles of most kettles and electric iron.

- Clinical thermometer use mercury because mercury is a good conductor of heat.

-Aluminum in some cases is used to make motor vehicles engines and other engines accessories because it can easily transfer or exchange heat from a hot engine to the environment.

-Electronic devices attached to heat sinks to protect them from overheating.

8. (a) An earthquakes is a sudden motion or shaking of the earth caused by a sudden release of energy that has accumulated within or along the edges of the earth's tectonic plates. **02 marks**

(b) –Thermal indicator

- Water indicator **01@ = 04 marks**
- Seismo electromagnetic indicator
- Animal indicator
- Human indicator

(C) -Pick a safe place where things will not fall

-wait in your safe place until the shaking stops. **01@ = 04 marks**

- If you are outside during an earthquakes, stay outside.

- After shaking stops, help other people around you.

SECTION C (25 MARKS)

9. (a) (i) Ohm's law states that; the voltage across a conductor is directly proportional to the current flowing through it, provided all physical conditions and temperatures remain constant**.** **02 marks**

(ii). –Temperature

-Length of the conductor **01@ = 04 marks**

- Cross- section area
- Nature of material

(b) (i) **Insulators** **01.5 marks**

Forbidden energy gap is small compared to that of insulators has a large value of energy. No electron can acquire such energy in order to cross the gap and enter the conduction band, therefore an insulator cannot conduct electricity.

Semiconductors **01.5 marks**

Forbidden energy gap is small compared to that of insulators, as temperature change, some electrons in valence band acquire energy greater than the forbidden energy gap, the electrons become free to conduct electricity and hence the material becomes a conductor.

Insulators **01.5 marks**

In conductors, no forbidden gape. This cause small energy is required to transfer electrons from the valence band to the conduction band. Such energy can be obtained even at very low temperatures; hence metals are good conductors of electricity.

(ii) In DC generator, the electrical current flows only in one direction. In an AC generator, the coil through which the current flows is fixed while the magnet moves**.** **02 marks**

10. (a) When the length of a string is changed, it will vibrate with a different frequency. The shorter strings have higher frequency and therefore higher pitch. **02 marks**

(b) **Solution**

Given

Length = 75 cm = 0.75 m

Mass of string = 8.2 g = 0.0082 kg **0.5 marks**

Tension of the string = 18 N

From

$\mu = \frac{M}{L} = \frac{0.0082}{0.75}$ = 0.011 Kg/m **01 marks**

then,

$V = \sqrt{\frac{T}{M}} = \sqrt{\frac{18}{0.011}}$ = 40.5 m/s **01 marks**

From

$F_n = \frac{nV}{2L}$ **0.5 marks**

First harmonic, n=1 so

$F_1 = \frac{v}{2L} = \frac{40.5}{2\ X\ 0.75}$ = 27 Hz **01 marks**

Third harmonic,

$F_3 = \frac{3v}{2L} = \frac{3\ X\ 40.5}{2\ X\ 0.75}$ = 81 Hz **01 marks**

The first harmonic = 27 Hz **0.5 marks**

The third harmonic = 81 Hz **0.5 marks**

(c) **Solution**

Given

V_p = 240 V V_s = 12 V **0.5 marks**

Np = 600 turns N_s = ?

From $\frac{NP}{NS} = \frac{VP}{VS}$ **01 marks**

$\frac{600\ turns}{NS} = \frac{240\ V}{12\ V}$ **01 marks**

$N_S = \frac{12\ V}{240\ v}$ x 600 turns **01 marks**

= 30 turns

Therefore, the number of turns in secondary coil is 30. **01 marks**

11. (a) In P-type semiconductors the majority charge carrier are holes which are positive WHILE in N-type semiconductors the majority charge carriers are electrons which are negative that's why are some semiconductors called P-type and others N- type (3 marks).

(b) A semiconductor diode is connected as forward bias when the anode (positive terminal) is connected to P side and Cathode (negative terminal) in N-side of the PN junction of the diode (3 marks)

(ii) Solution

Upthrust in water = $W_o - W_2$ = 8.6 N – 5.4 N = 3.2 N **0.5 marks**

Upthrust in liquid = $W_o - W_1$ = 8.6 N – 6.0 N = 2.6 N **0.5 marks**

By Archimedes' principle

Upthrust = weight of the displaced fluid

Note, 1 g = 0.01 N

Mass of displaced water = $\frac{w}{g}$

= $\frac{3.2}{0.01}$ g = 320 g **01 marks**

Volume V of water displaced = $\frac{260\ g}{1\ g/cm3}$ = 260 cm^3

Hence, the volume of liquid displaced is 260 cm^3 **01 marks**

Mass of liquid displaced = $\frac{w}{g} = \frac{3.2\ N}{0.01\ N/g}$ = 320 g **1 marks**

Then, Density of liquid = $\frac{m}{v} = \frac{320\ g}{260\ cm3}$ 1.2 g/cm^3 **1 marks**

Relative density of liquid = $\frac{density\ of\ liquid}{density\ of\ water} = \frac{1.2\ g/cm3}{1.0 g/cm3}$ = 1.2 **01 marks**

Relative density of liquid = 1.2 (0.5 marks)