

**PRESIDENT OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
FORM FOUR PRE-NECTA I (2023)
PHYSICS MARKING GUIDE**

1.

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

10 Marks @ =1

2.

i	ii	iii	iv	v	vi
A	B	C	D	E	J

6 marks @ = 1

3. a) $V_c = 60 \cos 60$
 $= 60 \times 0.5$
 $= 30\text{N}$

04 marks

b) The nail is not driven into the wood

Thus

$$V_c = 60 \cos 90^\circ$$

$$= 0$$

06 marks

4. a) i) The boots for soccer and hockey player have studs on their soles this is to avoid slipping during playing. This is because the studs decrease the area of contact between the feet of the player and the ground. As a result, pressure of the feet on the ground increase and the player can run about the ground without slipping.

ii) The force required by man to move his limbs immersed in water is smaller than the force for the same movement in air this is because the upthrust (buoyancy force) on a body is much more in water than that when immersed in air. Therefore, the effective of the limbs of a man is less in water than in air. For this reason, the force required to move his limbs in water is much smaller than the force for the same movements in air.

b) i) Diameter of the base of conical flask (d) = 7.0cm = r 3.5cm = 0.035m

The depth of the liquid (h) = 10cm = 0.1m

Density of the liquid (ρ_l) = 840kg/m³

Force due to liquid (F) = unknown

Solution

From the formula of force

$$F = mg \text{-----(i)}$$

But from density

$$m = \rho V \text{-----(ii)}$$

Where

m = mass of the liquid

ρ = Density of the liquid

V = Volume of the liquid

Then

$$V = Ah = \pi^2 h \text{-----(iii)}$$

Substitute equation (ii) and (iii) to equation (i)

ii) Data given

Cross section area = A

Force = F

Height = H

Density = ρ

Required the pressure of liquid = P

Solution

$$\text{Pressure (P)} = \frac{\text{force(F)}}{\text{Area(A)}}$$

$$P = \frac{F}{A} \text{-----(i)}$$

But

$$F = mg \text{----- (ii)}$$

Then

$$F = \rho \pi h g r^2$$

$$F = 840 \text{kg/m}^3 \times 3.14 \times 0.1 \text{m}$$

$$\times 9.8 \text{m/s}^2$$

$$\times (0.035 \text{m})^2$$

$$F = 3.1664 \text{N} \approx 3.17 \text{N}$$

Find the total force due to the liquid on the base in Newton's 3.17N

$$m = \rho V \text{-----(iii)}$$

Also

$$V = Ah \text{ -----(iv)}$$

Substitute equation (ii), (iii) and (iv) to equation (i)

$$P = \frac{\rho Ahg}{A}$$

$$P = \rho hg$$

The pressure P exerted by the liquid on the bottom of the cylinder is given as $P = \rho hg$

Hence driven!!!

5. a) i) According to newton's second law of motion,

$$\text{Force (F)} = \frac{\text{Mass (m)} \times \text{change in velocity } \Delta V}{\text{time taken (t)}} \quad \mathbf{1 \text{ mark}}$$

Thereby, a person falling on a cemented floor gets more hurt than a person falling on a sand floor, because on falling on a sand floor, the time of impact increase due to depression of sands and this cause a decrease in impulsive force and hence less hurt **2 marks**

- ii) According to newton's third law of motion, for every action, there is an equal but opposite reaction

Thereby, the hunter moves abruptly backwards because of the reaction force which is equal but opposite to the action force of the bullet during firing

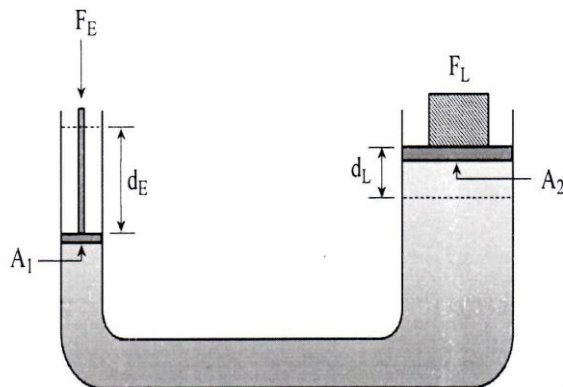
$1\frac{1}{2}$ marks

- b) Data given Efficiency of hydraulic press, $e = 90\%$

Diameter of a large cylinder is eight times the diameter of a small cylinder,
 $D_2 = 8D_1$.

Required: Mechanical advantage of hydraulic press, MA

Solution



Here, a student is required to draw a well labelled cross-sectional diagram of a hydraulic press as shown below

Also, a student is required to express the relationship between the cross sectional area of the cylinder and the distance by which it is moved in order to find velocity ratio of the machine.

From the figure, it is clearly that the cross - sectional area of each cylinder is inversely proportional to the distance by which it is moved. That is,

$$A_1 \propto \frac{1}{d_E}$$

$$A_1 = \frac{K}{d_E}$$

$$K = A_1 d_E$$

$$A_2 \propto \frac{1}{d_L}$$

$$A_2 = \frac{K}{d_L}$$

$$K = A_2 d_L$$

Where K = Volume of liquid displaced by either cylinders of the hydraulic press.

This means that, $A_1 d_E = A_2 d_L$

Rearranging it, we have

$$\frac{d_E}{d_L} = \frac{A^2}{A^1}$$

$$\frac{d_E}{d_L} = \frac{\pi \frac{D_2^2}{4}}{\pi \frac{D_1^2}{4}}$$

$$\frac{d_E}{d_L} = \frac{D_2^2}{D_1^2}$$

Recall that $D_2 = 8D_1$. Thus,

$$\frac{d_E}{d_L} = \frac{(8D_1)^2}{D_1^2}$$

$$\frac{d_E}{d_L} = \frac{64D_1^2}{D_1^2}$$

$$\frac{d_E}{d_L} = 64$$

Since V.R = $\frac{d_E}{d_L}$, Then

$$V.R = 64 \quad \frac{1}{2} \text{ mark}$$

$$e = \frac{M.A}{V.R} \times 100\% \quad \frac{1}{2} \text{ mark}$$

$$e \times V.R = M.A \times 100\%$$

$$M.A = \frac{e \times V.R}{100\%}$$

$$M.A = \frac{90\% \times 64}{100\%}$$

$$M.A = 57.6$$

1 mark

The mechanical advantage of hydraulic press is 57.6

Total 9 marks

6. a) Use Newton's second law of motion to deduce that, impulse is equal to the change of linear momentum of a body, and explain why it necessary important to fold our legs when we jump from a height on landing

5 marks

Expected response

From Newton's second law

The force applied F is proportional to the rate of change of linear momentum $\frac{\Delta P}{\Delta t}$

Then mathematically,

$$F \propto \frac{\Delta P}{\Delta t}$$

$$F = K \frac{\Delta P}{\Delta t}$$

Where $k = 1$ = proportionality constant

$$F = \frac{\Delta P}{\Delta t}$$

$$F \Delta t = \Delta p$$

But $F \Delta t$ = impulse

$$\text{Impulse} = \Delta p$$

It is necessary to fold the legs when jumping from a height on landing in order to extend time of impact of force (increase impulse) in order to reduce pain.

- b) A car with cambered wheels cannot overturn instead it will only skids because the cambered wheels make it very stable.

4 marks

7. a) Heat capacity is the amount of heat required to raise a temperature of a body by one kelvin WHILE Specific heat capacity is the amount of heat required to raise unit mass of a substance by one kelvin **2 marks**

b) $\theta_1 - \theta_f = \theta_f - \theta_2$

$$\theta_f + \theta_f = \theta_1 + \theta_2$$

$$\frac{2\theta_f}{2} = \frac{\theta_1 + \theta_2}{2} \quad \mathbf{1 \text{ mark}}$$

$$\theta_f = \frac{(25+35)^{\circ}\text{C}}{2} \quad \mathbf{1 \text{ mark}}$$

$$= \frac{60^{\circ}\text{C}}{2}$$

$$\theta_f = 30^{\circ}\text{C}$$

The equilibrium temperature = 30°C **2 marks**

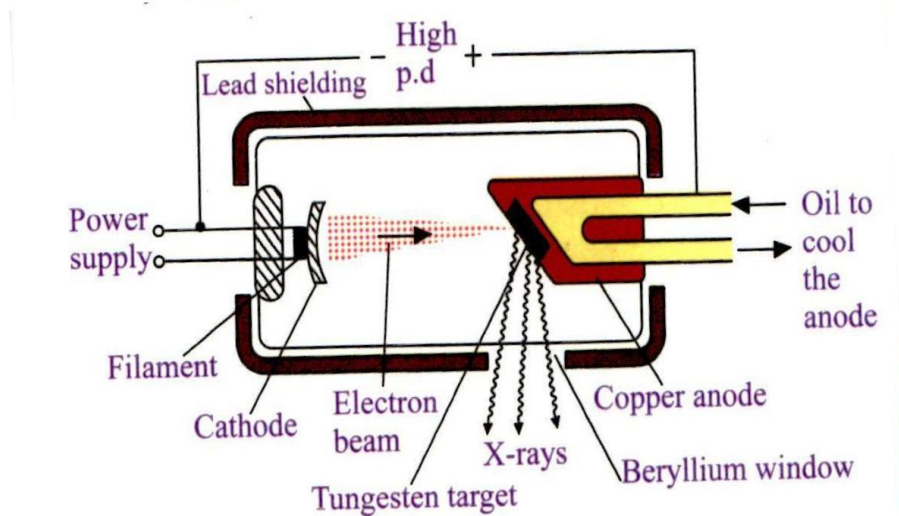
8. b) i) An object appears coloured when light falls onto it because the object reflects light of its colour falling onto it, and it absorbs the rest. **2 marks**
- ii) Pigment are impure while light is pure. A yellow pigment absorbs blue light and reflects yellow red and green and a blue pigment absorbs yellow and red lights and reflect blue and green. When the two are mixed only green light will be reflected in common blue light and yellow light are complementary colour they add to white.

5 marks

9. a) The effects of x-rays to human being are
- Destroy cells and can cause cancer
 - Can cause mutation due to destroy of genitals

$1\frac{1}{2} @ = 3 \text{ marks}$

- b) i) X-rays are produced when filament or a cathode which emits fast moving electrons into a vacuum accelerates from cathode to strike a target with an anode which some of kinetic energy converted to x-rays



ii) Use of x-

- In medical field soft x-rays, used to detect broken or fractured bones or some disease in soft tissue and treatment of cancer
- Crystallography: experiment study of the arrangement of atom in solid (study of arrangement of crystals)
- Astronomy: x-ray emitted by celestial objects are used observational astronomy
- x-ray microscopic analysis: involves the use of electromagnetic radiation in the soft x – ray band to produce image of very small object

1 @ 4 marks

10. a) Faraday's law of electromagnetic states that

“Whenever there is change in magnetic flux linked with a closed circuit e.m.f induced whose magnitude is directly proportional to the rate of change of the magnetic flux linking the conductor”

2.5 marks

Lenz's law states that

“The direction of induced e.m.f is such that the resulting induced current flows in such a direction that oppose the change that cause it”

2 marks

b)

	Name 1 mark @	Reason 1.5 mark @	Function 1.5 mark @
i	Step down transformer	Has low number of turns in secondary coil	To step down electricity before used in houses
ii	Step up transformer	Has high number of turns in secondary coil	To step up (increase) electricity from power station

11. a) The diagram of cathode ray tube

Cathode ray tube used in

- Computer display
- Television **any two 1 mark @**
- Cathode – ray oscilloscope (CRO)

Properties of cathode rays

- They travel in straight lines
- They carry negative charges
- They have energy and momentum
- they affect photographic plates **any two 1 mark @**

b)

Device	Purpose
Diode	To allow current to flow through it in one direction
Transistor	To amplify or switch electronic signals and electrical power

2 marks @

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PHYSICS SERIES

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