PHYSICS 530/2 MARKING GUIDE 2022

UGANDA NATIONAL EXAMINATIONS BOARD
NOVEMBER - DECEMBER, 2020

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Qn	Scoring points	Notes	Mark
1a(i)	Length; Mass; Time; temperature, electric current, amount of substance, Luminius intensity	(first three)	3
(ii)	Length in metres (m); mass in kilograms (kg), Time in seconds (s), temperature in kelvin (K), electric current in amperes (A), amount of substance in moles (mol) Luminius intensity in candela (Cd).	(any one)	1
(b)	- Measure the mass; 'a' of the stone on a spring balance. - Fill a measuring cylinder with water and note its first reading; b - With the help of the thread, lower the piece of stone into the water until it is completely immersed and note the second water level reading; c. - The density of the stone is calculated from density $= \frac{a}{c-b}$;	measure the mass; 'a' of the stone. Fill a displacement can with water until it just flows out; Put a measuring cylinder below the spout With help of a thread lower the stone gently into the displacement can until it is submerged. Read the volume; V Then Density $= \frac{a}{V}$;	4
(c)(i)	Volume of block $= \frac{\text{loss of mass in water}}{\text{density of water}}$ $= \frac{120-100}{1}$; $= 20\,cm^3$;	Volume of block = Volume of water displaced $= \frac{\text{Mass of water displaced}}{\text{density of water}}$ $= \frac{120-100}{1}$; $= 20\,cm^3$;	2
(ii)	Density of the block $= \frac{\text{mass}}{\text{Volume}}$, $= \frac{120\,g}{20\,cm^3}$, $= 6\,g\,cm^{-3}$;	Also note $V = 120-100$; $= 20\,cm^3$; and $V = 120-100$; $= 20g$, and $V = \frac{120-100}{}$; $= 20$,	2

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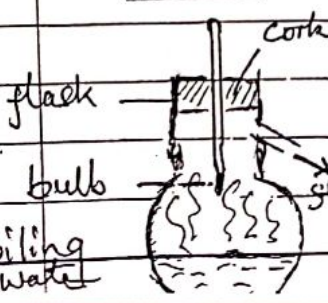
Qn	Scoring Points	Notes	mark
(d)	Pressure = Force / Minimum Surface Area;	$P = \frac{F}{\text{Min. area}}$;	
	$= \frac{9.6 \times 10}{4.0 \times 10^{-2} \times 6 \times 10^{-2}}$;	$= \frac{9.6 \times 10}{0.04 \times 0.06}$;	
	$= \frac{96 \times 10^4}{24}$	$= 4000\ Pa$;	
	$= 4.0 \times 10^4\ Pa = 4000\ Pa$;	Or $P = \frac{F}{\text{min area}}$;	
		$= \frac{9.6 \times 10}{4 \times 6}$;	4
		$= 4 N cm^{-2}$;	
Total			16
2(a)	It is the transimission of heat through a substance from a region of high temperature to a region of lower temperature without the movement of matter as a whole.;	Transfer of heat energy from particle to particle in matter;	1
(b)	 Place thermometer bulb in pure melting ice; When the mercury thread has remained steady; Mark the position of the mercury thread. This is the Lower fixed point;	First mark can be scored on the diagram	
	 The bulb of the thermometer is placed in vapour from water boiling at Standard atmospheric pressure;	Push a thermometer in pure vapour; by not allowing the bulb to be dipped in boiling water	4

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Qn	Scoring Points	Notes	Mar
	The mercury thread rises to a steady Point.; This point is marked as the upper fixed point.;	When the thread has remained steady; for some time, mark its level this is the upper fixed point.;	2
(c)	$\theta = \frac{2c}{y} \times 100^\circ C$.; $= \frac{68}{194} \times 100^\circ C$.; $= 35^\circ C$.;		
(d)	Radiations from the sun falling on the glass are of short wave length; hence penetrate the glass. The radiations are absorbed by plants and soil; inside the house which becomes warm objects; The warm objects inside radiate energy of long wavelength; which cannot penetrate glass but remain inside the house;	Radiations from the Sun of short wave length; penetrate the atmosphere The radiations are absorbed by the earth's surface and other objects, become warm; The earth and objects then radiate long wave length; radiations which are absorbed by green house gases in the atmosphere. The warm atmosphere radiate back to earth raising; it's temperature.	3
(e)	The dull surface absorbs most of the energy that falls on it; while the shinny surface reflects most energy falling on it;. When touched the body extracts more heat from the dull one than from the shinny one; thus the dull surface feels hotter.		3
Total			

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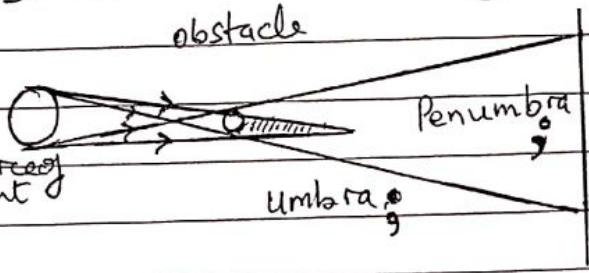
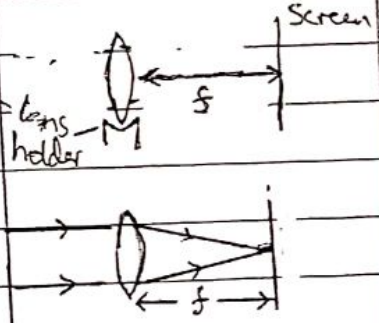
Qn	Scoring Points	Notes	Marks
a 3a(i)	Light travels in a straight line;	—	1
(ii)		—	2
(iii)	They are: Virtual; Laterally inverted; Same size as the object; as far behind the mirror as the object is in front; Upright;	(any first two)	1
(b)	Fix the lens on a holder and placed in front of a screen; . Adjust the position of the screen until a focussed image of a distant object is formed on it.; Measure the distance between the lens and the screen; This distance equals to focal length; .		4
(c) (i)	Is the angle of incidence in a denser medium for which the angle of refraction in the less dense medium is 90°.;		1
(ii)	Light must be travelling from a denser medium to a less dense medium.; - Angle of incidence in the denser medium must be greater than the critical angle.;		2
d(i)	From $n = \frac{\sin i}{\sin r}$; $1.5 = \frac{\sin(90^\circ - 51)}{\sin i}$; $\sin i = \frac{\sin 39^\circ}{1.5}$. $= 0.4195$ $i^\circ = 24.805 = 24.8^\circ$;	$n \sin i$ = constant. $n_1 \sin i_1 = n_2 \sin i_2$; $1.5 \sin i = 1 \times \sin 39^\circ$; $\sin i = \frac{\sin 39^\circ}{1.5}$; $\sin i = 0.4195$; $i = 24.8^\circ$; Accept 25°	3

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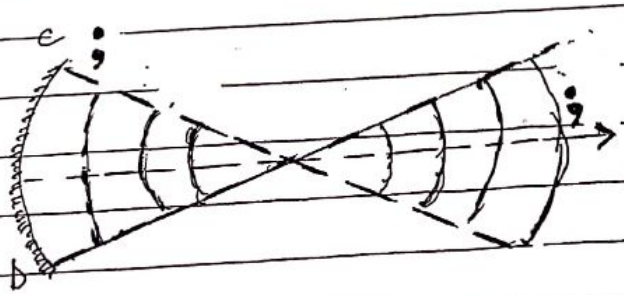
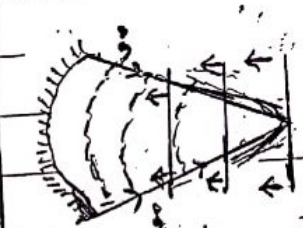
Qn	Scoring Points	notes	mar
ii	- Have wide fields of view ; - Produce upright images ;		2 16
Total			
4a(i)	Points of zero amplitude on a standing wave ; or points of rest on a standing wave.	Accept points of zero displacement. ;	1 1
(ii)	Points of Maximum amplitude on a standing wave. ;		1
(b)	Waves that move from the source to another region while transfering energy ;		1
c(i)	frequency (f) = $\frac{\text{Number of vibrations}}{\text{time}}$, = $\frac{200}{2}$, = 100 Hz ;		2 1
(ii)	$\lambda = \frac{v}{f}$, = $\frac{320}{100}$, = 3.2m ;		2.
(d)		Pattern ; direction ;	2.
c(ii)	The forcing frequency must be equal to the natural frequency of the body ; - Also the object must have more than one natural frequency.	 There must be a regular external source of energy.	1

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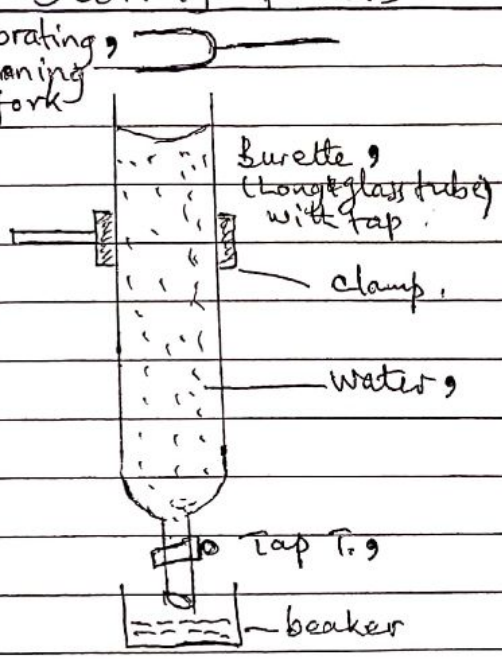
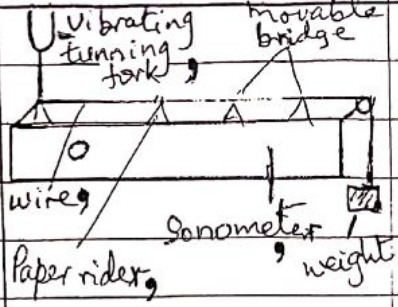
Qn	Scoring Points	notes	marks
(ii)			
	The apparatus is set up as shown. The turning fork is hit to vibrate and then placed near the mouth of the tube ; The tap is opened to allow water to flow slowly ; Loud sound ; is heard which is due to resonance.	A vibrating turning fork is placed in contact with one fixed bridge. ; The movable bridge is adjusted until the paper rider is thrown off the Sonometer wire due to vibration ; This is due to resonance ;	5
(iii)	- used to measure the speed of sound in air ; - determining the frequency of a.c. source - Used in tuning radios. - used in diving spring boards.	(first one)	1
Total			16

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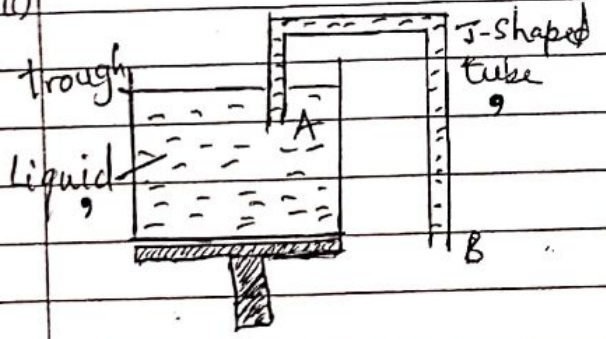
Qn	Scoring points	notes	mark
5a(i)	Adhesion - force of attraction between molecules of different substances.; Cohesion - force of attraction between molecules of the same substance;		2
(b)	- Change in temperature; - Presence of impurities; - Mechanical disturbance of the surface; - Nature of the liquid.	(the first three)	3
(c)(i)	 The siphon is set up as shown in the diagram. Fill the tube with the liquid by sucking at end B.; On releasing; the liquid runs out through the tube continuously;		4
(ii)	- emptying petrol from drums; - Removing water from fish aquaria (Pond) - Operation of water closet (flash toilets)	(first one.)	1
(d)	Atmospheric pressure on to earth's surface is due to total weight of air on it.; As one goes higher and higher the quantity of air above decreases.;		2

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Qn	Scoring Points	marks	marks
	This decreases the atmospheric pressure;		1
(e)	$\frac{\text{Force on piston}}{\text{Area of piston}} = \frac{\text{Force of platform}}{\text{Area of platform}}$;		
	$\frac{20}{0.2} = \frac{F}{2}$;		
	$F = \frac{20 \times 2}{0.2}$		
	$= 200\,N$;		3
Total			16
6(a)	Protons and neutrons; are located in the nucleus; of an atom and electrons; are located in the orbits; that surround the nucleus.	orbit; electron; nucleus; (Protons and nutrons);	2
(b)	Radioisotopes are atoms of the same element with the same atomic number but different mass numbers that are radioactive;		1
(c)	$^{214}_{82}P \longrightarrow {}^{a}_{b}Q + 2\,{}^{4}_{2}He + {}^{0}_{-1}e$;;;	(i) $^{214}_{82}P \rightarrow {}^{206}_{79}Q + 2\,{}^{4}_{2}He + {}^{0}_{-1}e$;;;	
	$214 = a + 8 + 0$; $\Rightarrow a = 214 - 8 = 206$	(ii) Mass number = 206;	
	$82 = b + 4 - 1$; $\Rightarrow b = 82 - 3 = 79$	Atomic number = 79;	
	mass number of Q = 206;	$^{214}_{82}P \rightarrow Q + 2\,{}^{4}_{2}He + {}^{0}_{-1}e$;;;	
	atomic number of Q = 79;	Mass no = 206; Atomic no = 79;	4
(d)(i)	Half life is the time taken for a half of the nuclei of a radioactive substance to decay / disintegrate;		1

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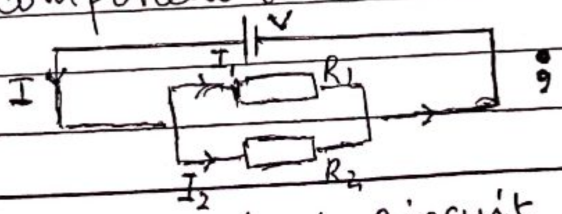
Qn	Scoring Points	notes	Mark
(ii)	$48g \xrightarrow{1t_{\frac{1}{2}}} 24g \xrightarrow{2t_{\frac{1}{2}}} 12g \xrightarrow{3t_{\frac{1}{2}}} 6g \xrightarrow{4t_{\frac{1}{2}}} 3g$; ; ; ;	$\frac{No}{Nt} = 2^{t/T_{\frac{1}{2}}}$; $\frac{48}{Nt} = 2^{8/2}$;	3
	Mass that decays $= 48 - 3 = 45g$;	$\frac{48}{Nt} = 2^4$	
(e)	Industrial applications of Radioactivity.	$Nt = \frac{48}{16} = 3g$;	1
	- Source of energy	$D = No - Nt = 48 - 3 = 45g$;	
	- To measure thickness of sheets		
	- In food production	(first 2).	2
	- As tracers in identifying oil		
	- leakages in oil pipe lines.		
	- Hardening of rubber.		
	- Detecting flaws in metal castings		
	- Determining the rate of wear and tear.		
(f)(i)	Nuclear fission is the disintergrating or splitting of heavy nucleus into two lighter nuclei with release of energy ;	(First one)	1
			1
(ii)	Heavy nuclide. ;		
	Low temperature		
	moving nuetrons	(first one)	1
(iii)	- There must be two lighter nuclide ;		
	- High temperature is required.		16
Total			
7a(i)	Electrical resistance is the opposition to the flow of current through a component in the circuit ;	component or conductor. Ratio of p.d to current $R = \frac{V}{I}$.	1
(ii)	 ;		1

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Qn	Scoring points	notes	marks
	From Ohm's law $V = IR \Rightarrow I = \frac{V}{R}$		
	P.d across $R_1 = V = I_1R_2 \Rightarrow I_1 = \frac{V}{R_1}$;		
	P.d across $R_2 = V = I_2R_2 \Rightarrow I_2 = \frac{V}{R_2}$;		
	Total current $I = I_1 + I_2$;		
	$\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2}$		
	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$; $\left(R = \frac{R_1R_2}{R_1+R_2}\right)$		3
b(i)	Internal resistance = 2.75 Ω and in series with external resistance.	$R = \frac{R_1R_2}{R_1+R_2} + r$	
	External resistance $\frac{1}{R} = \frac{1}{3} + \frac{1}{9} = \frac{4}{9}$	$= \frac{3\times 9}{3+9}$; $+ 2.75$	
	$\therefore R = 2.25$;	$= 5\Omega$;	
	Total resistance = 2.75 + 2.25 = 5Ω;	Last two marks	2
(ii)	Total current in circuit = $V = IR$	$I_1 = \left(\frac{9}{(9+3)}\right) \times 2$	
	$10 = I \times 5$	$= \frac{9}{12} \times 2$	
	$\therefore I = 2A$;	$= 1.5A$;	
	P.d across Combined resistors	$P = I^2R$	
	$V = 2 \times 2.25 = 4.5V$;	$= 1.5^2 \times 3$	
	Power in 3Ω, $P = \frac{V^2}{R} = \frac{4.5^2}{3} = 6.75W$;	$= 6.75W$;	3
c(i)	Power lost due to resistance in the transmitting wires.;	$P = IV$	
		$= 1.5 \times 4.5$;	
		$= 6.75w$;	1
(ii)	It is reduced by lowering; the current when the P.d is stepped up;	Thick wires; of low; resistance can be used	2

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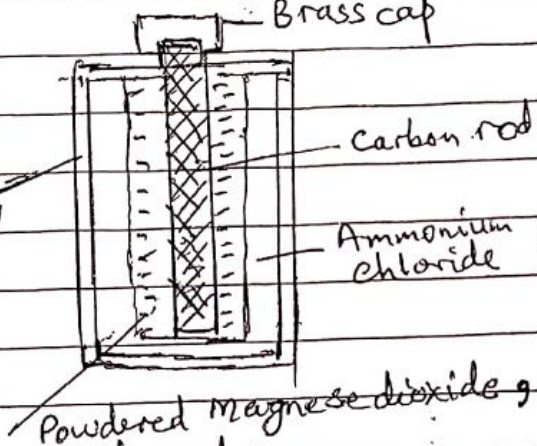
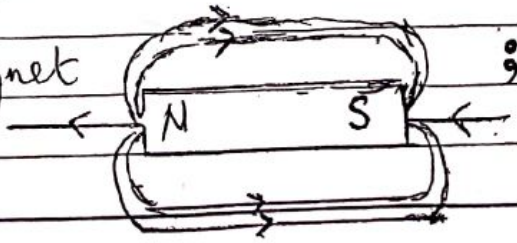
8a	Scoring Points	notes	mark
d(i)			2
(ii)	Connect d.c of greater e.m.f than that of accumulator. The positive of the supply is connected to the positive of the battery and the negative of the supply to the negative of the battery	By passing d.c of suitable value in opposition to the e.m.f of the accumulator.	1
Total			16
8a(i)	In ferromagnetic materials, the dipoles (atomic magnets) in the domains are aligned in one direction while in a non-ferromagnetic materials the dipoles are aligned randomly;	Ferromagnetic material is that which is strongly attracted by a magnet. Non-ferromagnetic material is that which is weakly attracted by a magnet;	1
(ii)	Ferromagnetic materials - Iron, Nickel, Cobalt, Steel non-ferromagnetic materials - glass, Copper, wood, brass	- Can be magnetized, can not be magnetized; (the first two)	2
b(i)	Bar Magnet 	Pattern Direction	1

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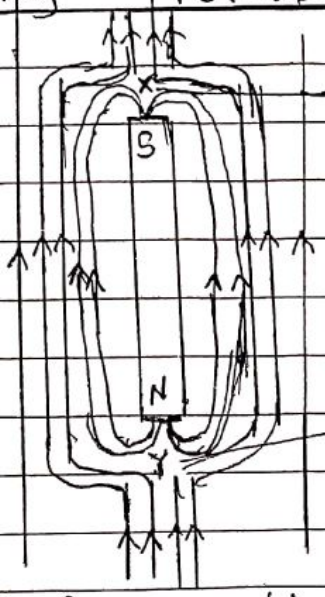
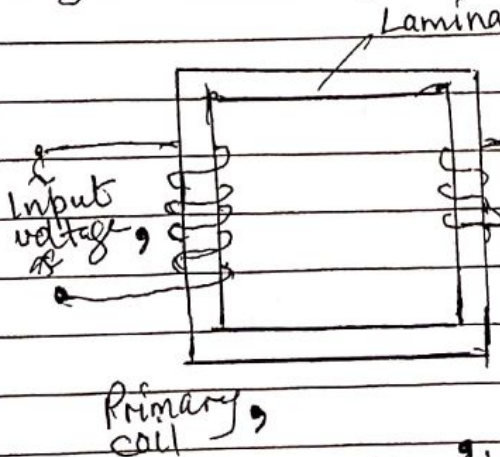
On	Scoring Points	notes	marks
	 X-neutral Point; Pattern; direction; Y-neutral Point;		
	Bar magnet in a magnetic field with south pole facing the earth's north		2
(c)(i)	- magnitude of current;	(First three)	
	- Length of the conductor.;		
	- Strength of a magnet;		
	- angle between magnetic field and conductor.		3
(ii)		(any four)	
	When an a.c voltage is applied to the primary coil, it produces a change in magnetic flux (field) which links		3½

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	the secondary coil and therefore produces an alternating e.m.f of smaller value in it.		
(iii)	Given $n_p = 200$ turns $n_s = 1000$ turns $V_p = 1600V$ From $\frac{V_s}{V_p} = \frac{n_s}{n_p}$; $V_s = \frac{n_s}{n_p} \times V_p$. $= \frac{1000 \times 1600}{200}$; $= 8000V$; ∴ Voltage in Secondary coil = 8000V		
(iv)	- Eddy currents in the coil. ; - Flux leakage ; - Hysteresis in the coil (Magnetic reversals) - Ohmic Losses / resistance of the coil.	(first two)	
Total			