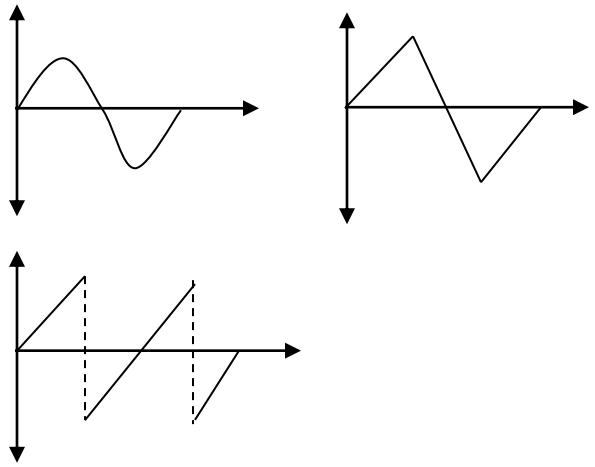
KCSE PHYSICS PAPER 232/1 2024

MARKING SCHEME.

NOTE:

- **The underlined part indicates the marking point and must be seen in the response or its equivalent as indicated in the side notes.**
- **What is enclosed in the brackets may be omitted in the response.**
- **Formula can be implied in the correct substitution.**
- **CORRECT SUBSTITUTION does not make a wrong formula correct.**

NO	EXPECTED RESPONSE.	SIDE NOTES	MARKS
1.	At 3.1cm√ The coincidence of the 5th vernier mark √	Do not mark on student's own diagram. Mark 2 is dependent of mark 1. 3.0cm mark of the main scale must be indicated. 4.0cm not a must indicated. Coincidence must be before the 4.0 mark.	2
2.	Weight is (dependent on force of gravity which is) always <u>directed towards the centre</u> (of the Earth/planet/celestial body)(hence a vector quantity.)		1
3.	Meta A expands more/faster than B (forcing it to bend inwards). Or Metal A has higher expansivity.		1
4.	The <u>turning effect of a force is given by Force x Distance. √/clockwise moment equals anticlockwise moment</u> Heavier child has higher force hence to balance, <u>the distance should be reduced</u>. √	Emphasis on reduction of distance and balancing(principle of moment) Deny reduction of	2

		force.	
5.	By leaning on the opposite side. Or Raising the opposite/other hand.	Any one	1
6.	When the piston is pushed inwards, the air above the tube moves faster/with increased velocity/with higher velocity/speed, √ Causing a region of low(er) pressure√ above the tube hence the liquid rises and mixes with air and is sprayed out. The vent allows the higher atmospheric pressure to act on the liquid to push√ it up the tube/higher atmospheric pushes the liquid up/ pressure difference causes the liquid to rise up.		3
7.		√ positive side √ negative side √ complete cycle. Marks are independent. The cycle must start with positive at zero/origin.	3
8.	Viscosity is friction/resistance (to motion) in fluids. or Friction in fluids. or Resistance in fluids.	Allow friction or resistance alone	1
9.	$VR = \frac{effortdistance\ E.d.}{load\ distance\ L.d.} = \frac{0.32}{0.2}\surd = 1.6\surd$	If the formula is correct and substitution, award the substitution mark at the formula.	2
10.	As the bubble rises up, the pressure due to the water column sorrounding the bubble is reduced√ therefore	Deny pressure of the bubble.	2

	the volume of the bubble increases√.	Deny bubble expand	
11.	Fc = mrω²√ = 0.2 x 1 x 10²√ = 20N√ Or $Fc = \frac{mv^2}{r} and\ v = \omega r\sqrt{}$ $Fc = \frac{mv^2}{r} = \frac{0.2 \times (1 \times 10)^2}{1}\sqrt{} = 20N\sqrt{}$		3
12.	The object displaces its own weight of the fluid in which it floats/law of flotation. √ Thi implies that the object is floating√ on/in water.		2
13.	a) The random collision of the smoke particles with the air particles. Or Collision of the smoke particles with air particles which are in (constant) random/uneven motion. b) The rate of collision increases (Random) increases. Increased velocity. Faster movement.	Any one	1 1
	SECTION TOTAL		25
SECTION B (55 MARKS)			
14.	a) i. Relative density is the ratio of density of a substance to the density of water. Or Number of times a substance is denser than water. ii. ➢ Used to determine density of (an unknown) substance from the density of water. ➢ Test for purity of substance eg milk. ➢ Check the state of charge of a car battery. ➢ Check the level of battery charge. ➢ In geology, to determine mineral content.	Definition from first principle only. Deny mention of an instrument like hydrometer only.	1 2

	➢ In brewery, to determine alcohol content. ➢ In hydrology, to determine water quality. b) i. ➢ <u>The weight of the balloon (and its content) is greater than</u> the weight of air displaced hence it <u>experiences a small upthrust</u>. ➢ On cooling, the volume of the balloon is reduced (density increased), hence balloon experiences reduced upthrust. ➢ Average density of balloon increased on cooling. ➢ Density of balloon is greater than that of the surrounding air. ii. • Fill the balloon with a gas which is less dense than air. • Fill the balloon with hydrogen or helium. • Increase the volume of the air in the balloon (by heating/warming) • Inflate the balloon with warm/hot air. • Cool the surrounding air/lower the temperature of the surrounding air. • Maintain the temperature of the air inside. c) Upthrust = weight of the liquid displaced. √ $= \frac{1.1 \times 10}{1}\sqrt{} = 11N\sqrt{}$ Or U = ρVg√ $1100 \times \frac{1000}{1000000} \times 10\sqrt{}$ = 11N√	(any two) Any two (from the fact that the balloon went down on cooling it)	2 2 3
			10

15.	a) i. Hooke's law or its correct statement. ii. Stand, clamp and boss *(accept just stand)* iii. (recording the length and the mass) determine the extension and force. √ Plot a graph of Force against extension. √ It is a straight line through the origin. √ Or Determine the extension and force. √ Compute F/e = k. (several values.) √ F/e is constant. √ b) $k = \frac{F}{e} = \frac{0.04N}{0.004m} = 10N/m\sqrt{}$ When e = 0.006m F = 10 x 0.006√ = 0.06N√ Or $k = \frac{F}{e} = \frac{0.04N}{0.4cm} = 0.1N/cm\sqrt{}$ When e = 0.6cm F = 0.1 x 0.6√ = 0.06N√ Or 0.4cm ===> 0.04N 0.6cm ===> F $F = \frac{0.6 \times 0.04}{0.4}\sqrt{}\sqrt{} = 0.06N\sqrt{}$ Or $F = \frac{0.04}{0.004} \times 0.006\sqrt{}\sqrt{} = 0.06N\sqrt{}$ Or $\frac{F1}{e1} = \frac{F2}{e2}\sqrt{}$ $\frac{0.04}{0.004} = \frac{F2}{0.006}\sqrt{}$ F2 = 0.06N√	Watch out for contradiction	1 1 3 3

	c) ➢ Using a thinner rod to coil the wire hence reduce the diameter of the spring. ➢ Make turns closer so as to have more turns per unit length. ➢ Using a shorter piece of wire to have a shorter spring/reduce the length of the spring. ➢ Reduce turns to make a shorter spring. ➢ Reduce distance between the turns/coils. ➢ Compressing spring until elastic limit is reached.	(any two) No mark for shorter wire only. No mark for compressing spring only.	2
			10
16.	a) I. Switch on the ticker timer and release the ball to fall freely. √ II. Get the time between dots from the frequency of the timer. √ III. Determine the initial and final velocities. IV. Use $a = \frac{v-u}{t}$ to determine acceleration due to gravity. √ Or I. Switch on the ticker timer and release the ball to fall freely. √ II. Obtain total time for several dots. √ III. Determine u and v. √ IV. Measure the distance between u and v and determine the acceleration a(g) using $v^2 = u^2 + 2gS$ or $S = ut + \frac{1}{2} gt^2$ √ or I. Switch on the ticker timer and release the ball to fall freely. √ II. Using distance charts, obtain the average velocities. √ III. Plot a average velocity against time graph. √ IV. Determine the slope of the graph which is the acceleration due to the gravity a. √		4

b) At maximium height T = 0√ when the velocity required is minimum.

Centripetal force = weight of the stone

$$\frac{mv^2}{r} = mg$$

$$v = \sqrt{rg}\sqrt{}$$

$v = \sqrt{1 \times 10}\sqrt{} = 3.162 m/s\sqrt{}$ (4 sf a must)

Or

$$\frac{mv^2}{r} - mg = T \quad and\ T = 0$$

$$\frac{mv^2}{r} = mg$$

V = 3.162m/s

Or

$T = 2\pi\sqrt{\frac{l}{g}}$

$T = 2 \times 3.142 \times \sqrt{\frac{1}{10}} = 1.985236$

$T = \frac{2\pi}{\omega}$

$\omega = \frac{2\pi}{1.985236} = 3.1626$

v = ωr

= 3.1626 x 1√= 3.162m/s√

$T = 2\pi\sqrt{\frac{l}{g}}$

$T = \frac{2\pi}{\omega}$

v = ωr

(1 formula mark for the three formulas together)

4

c)

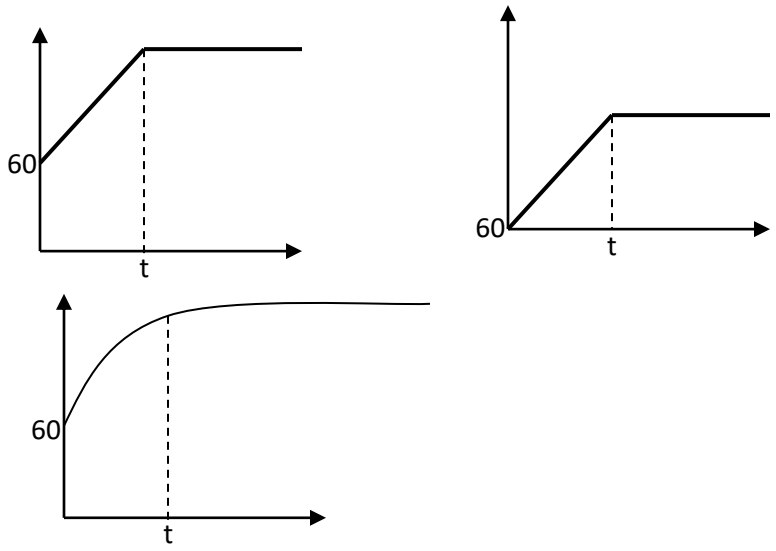
- Construction of speed governors.
- Separation of mixtures using centrifuges
- Launching of satellites.
- Somersaulting.
- Banking tracks.
- Rounding a bend.
- Merry go round.
- Turn tables
- Hammer and discus throwing.
- washing machines.

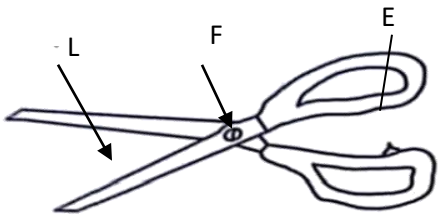
Any application of circular motion

2

10

17.	a) salt is <u>an impurity</u>√ which <u>lowers the melting point</u>√ b) -weight of the solid/force applied/load -base area/area of contact. (*deny surface area*) c) i. Heat lost (by hot water) = heat gained (by cold water) Or√ $m_h c\Delta T = m_c c\Delta T$ / $m_h c\Delta\theta = m_c c\Delta\theta$ $2c(70-\theta) = 3c(\theta-22)$ or $2\times4200\times(70-\theta) = 3\times4200\times(\theta-22)$ √ $\Theta = 41.2^0C$√ *Substitution can also be $2(70-\theta) = 3(\theta-22)$ since c cancells out.* Or $2\times4200\times70 + 3\times4200\times22 = 5\times4200\times\theta$√ $\Theta = 41.2^0C$√ Or Let the change for cold water be θ. New temperature will be 22 + θ New temperature change for warm water = 70 –(θ+22) $2c(70-(\theta+22)) = 3c\theta$√ $\Theta = 19.2^0C$ New temprature = 19.2 +22 = 41.2^0C√ Or Let the refence temperature be 20 (or any other temp) and change in temperature to the new final temperature be θ $2c(70-20) + 3c(22-20) = (2+3)\theta$√ $100 + 6 = 5\theta$ $\theta=21.2^0C$ new final temp = 20 + 21.2 = 41.2^0C√ or	Formula Substitution Answer	2 2 3

	Let the refence temperature be 100 (or any other temp) and change in temperature to the new final temperature be θ 2c(100-70) + 3c(100-22) = (2+3)cθ√ 60 + 3x78 = 5θ 60 + 234 =5θ θ=58.8^0C therefore new temprature = 100 -58.8 =41.2^0C√		
	ii. Heat absorbed by the container. Conduction by the container. Evaporation (of the hot water). Radiation of the heat from the container. Heat lost through convection. (*deny heat lost to the environment or sorrounding only)*	Any two	2
	d) i.  	√ for the shape. √ for indication of 60 and t The two marks are independent.	2
	ii. <u>Temperature of the water rises until it reaches boiling point</u>/100/becomes constant.√ When there is change of state at constant √temperature/constant temperature because of absorption of latent heat (of vaporisation) Latent heat absorbed to change state to gas.		2
			13

18.	a) Pressure in liquids increases with depth√ P = ρgh√ /pressure at bottom is greater than at the top. The bottom should be thicker to withstand the high(er) pressure.√		3
	b) i. $\frac{F1}{A1} = \frac{F2}{A2}$√ $F2 = \frac{200 \times 4}{0.2}$√ = 4000N√ Alt. P1 =P2√ $P = \frac{F}{A} = \frac{200}{0.2} = 1000$ $1000 = \frac{F}{4}$√ F = 4000N√		3
	ii. Water is corrosive (to internal parts) Water vaporises easily. Water has low viscosity. Water has high freezing point. Water has low boiling point Water becomes lubricant.	Any two	2
	c) i.  Figure 8	All three must be labelled correctly	1
	ii. Increasing load arm√ by putting the load as far as possible from the fulcrum.√ Or Reducing the effort distance√ by bringing effort closer √to the fulcrum/ holding closer.		2
	iii. Increasing the efficiency		1
			10
	SECTION TOTAL		55