URANGA PHYSICS EXAMINATION

Kenya Certificate of Secondary Education

232/1 PHYSICS **Paper 1**

(Theory)

4TH EDITION (JAN. 2022) – TIME 2 Hours

MARKING GUIDE

SECTION A (25 MARKS)

Answer all the questions in this section

1. *New reading = 40.0 – (24 × 0.5)*

= 28.0 cm^3 ✓1

Final volume = 50.0 – 28.0

=22.0 cm^3 ✓1 evaluation must be to 1d.p. ***2mks***

2.

(a) *Adhesion (adhesive force) ✓1*

Cohesion (cohesive force) ✓1

(b) *Touching breaks the water film/surface tension✓1; this makes water to leak* ***3mks***

3. $P = h\rho g$

$P_{air} = P_{atmospheric} - P_{town}$

$h \times 1.25 \times 10 = (76 \times 10^{-2} \times 13600 \times 10) - (55 \times 10^{-2} \times 13600 \times 10)$ ✓1

$h = \frac{(103360-74800)}{12.5} = \frac{28560}{12.5}$

h=2284.8m✓1 evaluation with correct units ***2mks***

4.

i. Brownian motion is the *random movement of liquid and gas particles/molecules*. ✓1

ii. *The salt particles occupy the small intermolecular spaces of water molecules✓*

2mks

5. *Thermometer in beaker C. ✓1*

- *more heat flows through a thicker conductor✓1 (conductor with larger cross-section area) per unit time. (due to larger number of atoms/particles per unit cross-section area responsible for heat transfer)* ***2mks***

6.

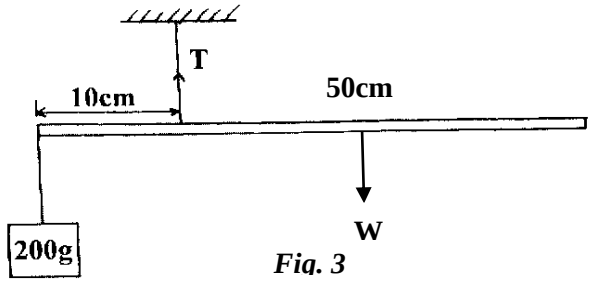


Fig. 3

Clockwise moment = anticlockwise moment

$W \times 0.4m = 2N \times 0.1m$*✓1 substitution*

$W = \frac{0.2Nm}{0.4m}$

W =0.5N✓1 for weight of rule

T = 0.5 +2

T= 2.5N✓1 evaluation in netwons(N)

2mks

7. *For a helical spring or any other elastic material, extension is directly proportional to the stretching force, provided elastic limit is not exceeded✓1* ***1mk***

8. *When gas is made to flow into the Bunsen burner, its velocity increases as it passes through the nozzle✓1; this decreases the pressure above the nozzle✓1. Air is then forced into the barrel by higher atmospheric pressure outside✓1. air is then forced into the barrel. The air and the gas then mix as they rise up and when ignited, a flame is produced.* ***2mks***

9. *The air molecules inside the can* ***gain more kinetic energy*** *✓1with temperature rise. This* ***increases rate of collision of air molecules with the walls of the can hence the momentum****✓1, thus* ***increasing the pressure****✓1 inside the can.* ***3mks***

10.

(a) $= (1 \times 60) + 45 + 0.74$

*= 105.74 seconds (s) ✓1 (**must show working)***

(b) *Period,* $\boldsymbol{T} = \frac{105.74}{50}$

$\boldsymbol{T}$*=2.1148s✓1 for period*

$2.1148^2 = \frac{4\pi^2 \times 1.20}{g}$ *✓1for substitution*

$g = \frac{47.3863872}{4.47237904}$

g=10.60 ms^{-2} ✓1 (or 10.60Nkg^{-1}) evaluation with correct units ***4mks***

11. $V.R = \frac{R}{r}$

$= \frac{40cm}{10cm} = 4$

$M.A = \frac{L}{E}$

$= \frac{300N}{100N} = 3$

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

$= \frac{3}{4} \times 100\%$ ✓*1*

$\eta = 75\%$ ✓*1*

2mks

Sub –total: 25*mks*

SECTION B (55 MARKS)

Answer all the questions in this section

12.

(a) *When a body is totally or partially immersed in a fluid, it experiences an upthrust equal to the weight of displaced fluid. ✓1*

(b)

(i) $mass = density \times volume$

$= 0.25 \times 100$ ✓*1 substitution*

=25g✓1 (or 0.025kg) correct evaluation

(ii) *Upthrust = weight of liquid displaced=weight of cork✓1*

$= 0.025 \times 10$

= 0.25N✓1

(iii) *Weight of displaced water when fully submerged =* $1000 \times 100 \times 10^{-6} \times 10$ ✓*1*

= 1.0N

Force required = 1.0-0.25

= 0.75N✓1 for evaluation

(c)

i. *Line drawn passing through four points✓1*

ii. $P = \frac{F}{A}$ *OR* $A = \frac{F}{P}$

Slope = A✓1 the relation

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

$= \frac{6-2}{400-200}$ ✓*1 correct extraction of points implied from graph*

= 0.02 m^2✓1 correct evaluation in m^2

iii. *Line drawn on the upper side of the crosses (**x**)✓1*

(c)

i) *By tilting the tube; if the tube is fully filled then the space is a vacuum but if the tube is not fully filled then the space is not a vacuum; it has some air(gas) occupying it ✓1*

ii) *Gas exert pressure on mercury surface, causing a shorter column, and therefore, the barometer is faulty✓1*

(d) P $= P_{atm} + h\rho g$

$= 103360 + (8 \times 1030 \times 10)$ *✓1 substitution*

$= 103360 + 82400$

= 185760 Nm^{-2} (or 185760Pa) ✓1 correct evaluation with units

16mks

13.

(a) *The change of velocity per unit time. ✓1 (OR rate of change of velocity)*

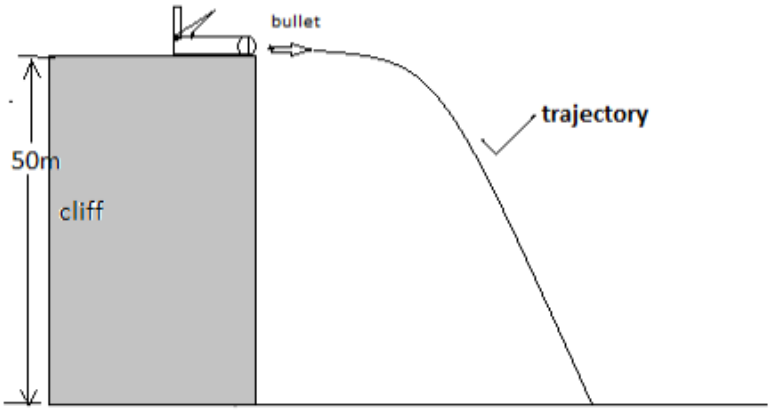
(b)

(i) *Rally car is moving uniform acceleration. (OR The velocity of the rally car increases uniformly with time) ✓1*

(ii)

(c)

I.



II. $s = {}^{1}/_{2}\, gt^2$ *since u =o*

$50 = {}^{1}/_{2} \times 10 \times t^2$ ✓*1 substitution into correct formula*

$100 = 10 \times t^2$

t = 3.162s ✓*1 evaluation at least to 2 d.p.*

III. *R =ut*

$= 400 \times 3.162$ ✓*1 substitution into correct formula*

= 1264.9m✓*1 evaluation at least to 1 d.p.*

08mks

14.

(a)

i) Latent heat of vaporization is *the heat required to change the state of a substance from liquid to gas/vapour (or from gas to liquid) without change in temperature.* ✓*1*

ii) Specific latent heat of vaporization is *the quantity of heat required to change a unit mass of a substance from liquid to vapor (or vapour to liquid) without change in temperature.* ✓*1*

(b)

I. *To measure/record the temperature of steam which is constant* ✓*1 at100^{0}C (even if there is presence impurities in the boiling water.*

II. *To reflect heat back to avoid heating the water in the beaker.* ✓*1*

III. *Mass of steam = 128-(100+25)*✓*1must show working*

$= 3g\ (or\ 3.0 \times 10^{-3} kg)$ ✓*1*

IV. *Heat gain = heat lose*

Heat gained by 25g water at 18^{0}C= (heat lost by condensing steam) + (heat lost by condensed steam)

$mc_W\Delta T = mL_V + mc_W\Delta T$ ✓*1*

$0.025 \times 4200 \times (T - 18) = (3.0 \times 10^{-3} \times 2.26 \times 10^{6}) + (3.0 \times 10^{-3} \times 4200 \times (100 - T))$ ✓*1*

$$105(T - 18) = 6780 + 12.6(100 - T)$$

$$105T - 1890 = 6780 + 1260 - 12.6T$$

$$105T + 12.6T = 8040 + 1890$$

$$117.6T = 9930$$

$$T = \frac{9930}{117.6}$$

T = 84.44^{0}C✓*1(or 357.44K) at least to 1 d.p.*

09mks

15.

(a)

(i) *Tension in the string✓1*

(ii) *Velocity changes due to instantaneous change in direction. ✓1*

(b)

(i) $T=mg$

$=1.8\times 10$ *✓1*

= 18N✓1

(ii) $T=F_c$

$F_c = mr\omega^2$ *✓1 formula that leads to the answer*

$18 = mr\omega^2$

$18 = 0.9\times 0.5\times \omega^2$ *✓1 correct substitution into formula*

$\omega^2 = \frac{18}{0.45}$

$= 40$

$\omega = \sqrt{40}$

ω *=6.325rads^{-1}✓1 evaluation at least to 4s.f with correct unit*

(c) *Velocity/Speed of object✓1*

Mass of object✓1

(d)

(i) $F_c = \frac{mv^2}{r}$

$= \frac{9.1\times10^{-31}\times(3.0\times10^8)^2}{6.2\times10^{-11}}$ *✓1 substitution into correct formula*

$= 1.321\times10^{-3}N$ *✓1 correct evaluation with units to 4s.f.*

(ii) *A long straight line at a tangent to the turntable. ✓1* **12mks**

16.

(a)

(i) *Effect produced when a force acts on a body for a short time interval✓1. OR Change in momentum of a body*

(ii)

$F = \frac{mv-mu}{t}$ *✓1 formula*

$= \frac{0.05(-6.5-4.5)}{0.02}$ *✓1 substitution*

$= \frac{-0.55}{0.02}$

= -27.5N✓1 evaluation

OR

$= \frac{0.05(6.5--4.5)}{0.02}$

$= \frac{0.55}{0.02}$

= 27.5N

(iii) *Change in momentum =Ft✓1 formula*

$= 27.5 \times 0.05$

$= 0.55\ kgms^{-1}$*(or Ns) ✓1 evaluation with correct units*

(iv) *Elastic collision✓1*

The ball is in contact with the wall for very short time before they ***separate****. ✓1(or the ball and wall do not fuse together and move with a common velocity)*

(b) *On a thick soft mattress, the athlete* ***experience retarding force for some time*** *before coming to rest;* ***increasing time of impact reducing the force of impact✓1*** *of the ground on the athlete when they finally come into contact.*

On hard ground, the athlete would abruptly come to rest and thus the ***time of the impact will be very short thus the ground applies a lot of impulsive force on the athlete****✓1, injuring him extensively.*

10mks

Sub-total:55mks

GRAND TOTAL: 80MARKS