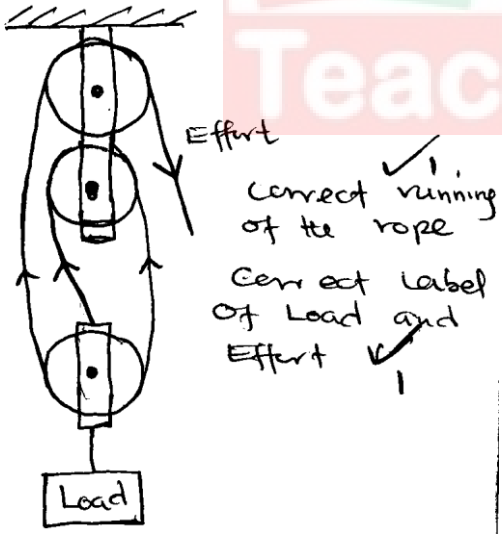
232/1
PHYSICS
PAPER 1
(THEORY)
FORM FOUR

END TERM 1 2022 EXAMS

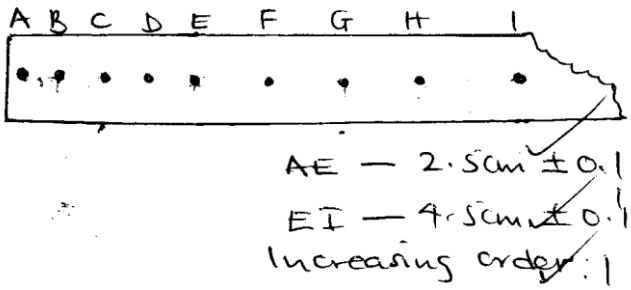
MARKING SCHEME

1. 16.21mm✓1 correct answer with correct units
   Accept 1.621cm or 0.01621m
2. Momentum is conserved momentum before = momentum after
   $72 \times 9 = 216 \times 4$✓1
   $\Rightarrow u = \frac{72 \times 9}{216}$✓1
   = 3.0m/s✓1
3. Roofing materials allows radiations to penetrate into the greenhouse✓1 but not out. Higher concentration of carbon dioxide inside the greenhouse helps to retain higher temperature by trapping/ insulating✓1 the heat.
4. 

5. V.R = 3✓1
6. Increase in temperature increases✓1 the speed of sound.
7. i) Convection takes place in air upwards direct due to✓1 to density defect.
   ii) Convection requires a ✓1 material medium but the space between the sun and the earth i.e. space of the atmosphere has no material medium
8. From the equation of continuity
   $A_1U_1 = A_2U_2$✓1(flow rate is constant)
   $120 \times 0.4 = 4 \times U_2$
   $\therefore U_2 = \frac{120 \times 0.4}{4}$✓1
   = 12 ms^{-1}✓1
9. Work done on the mass
   = force × distance
   = 25 ×10 × 120
   = 5000J.✓1
   Work done = power × time
   = 200 × 30✓1
   = 6000J✓1
   But $= \frac{work\ output}{work\ input} \times 100$
   $= \frac{5000}{6000} \times 100$
   = 83.3% ✓1
10. $\Delta H = MC\Delta\theta$
    $= \frac{150}{1000} \times 1000 \times 4200 \times (70 - 15) +$
    $390 \times 20 \times (70 - 15)$
    = 34650.000 + 429000
    = 463650✓1
    Energy dissipation E = pt
    $3000 \times t = 463650$✓1
    $\Rightarrow t = \frac{463650}{3000}$ = 154.55 sec✓1
11. At balance
    Sum of clockwise = sum of anti-clockwise moments
    $\left(\frac{180}{1000} \times 100\right) \times 40 = 30 \times X + (10 \times 1.8)$✓1
    $1.8 \times 40 = 30X + 18$
    $X = \frac{1.8 \times 40 - 18}{30}$✓1
    = 1.8N✓1
12. To increase surface area of contact thus reducing pressure exerted on the road✓1

SECTION B

13. a)



b) i) Velocity = $\frac{displacement}{time}$

$= \frac{2.5}{4\times0.02}$ ✓1

$= 31.25 cms^{-1}$ ✓1 **OR** $0.3125 ms^{-1}$

ii) E to I

Velocity = $\frac{4.5}{4\times0.02}$ ✓1

$= 56.25\ cms^{-1}$ ✓1

c) $a = \frac{u-u}{t}$

$= \frac{0.5625-0.3125}{0.02\times8}$

$= \frac{0.25}{0.16} = 1.5625 ms^{-2}$

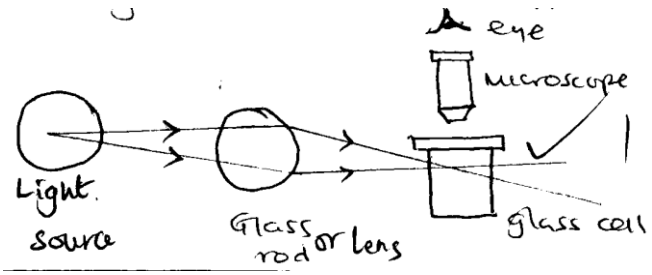
d) End A ✓1

e) i) Trolley runs on a straight path on the runway ✓1

ii) Tape lies flat on the horizontal surface. ✓1

14. i) Brownian motion is the continuous erratic/ random motion in either gas or liquid molecules ✓1

ii) - A small glass with air and carbon (smoke) particles ✓1
- the glass cell is strongly illuminated by a filament lamp directed by a perspex rod ✓1
- the particles scatter light and they can be viewed through a microscope ✓1
- they appear as bright specks (spots) moving with the same irregular random motion



b) i) $V = \pi r^2 h$

$0.01 \times (10^{-3})^3 = 3.14 \times r^2 \times h$ ✓1

$h = \frac{0.01\times10^{-9}}{3.14\times r^2}$ ✓1

$= \frac{0.01\times10^{-9}}{500\times10^{-4}} = 2\times10^{-10} m$ ✓1

ii) i) Oi 

a monolayer ✓1

ii) Oil patch formed is exactly circular. There is no evaporation of oil molecules movement/ spreading ✓1 of the oil molecules are elastic.

15. a) i) In elastic collision – K.E and momentum of the objects are conserved ✓1

Elastic collision – only momentum is conserved ✓1

ii) Initial momentum = Final momentum

$2M_BU_B + M_AU_A = 3MV$ ✓1

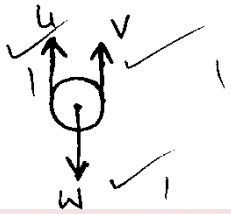
$0 + MU_A = 3Mu$ ✓1

$3Mu = MU$

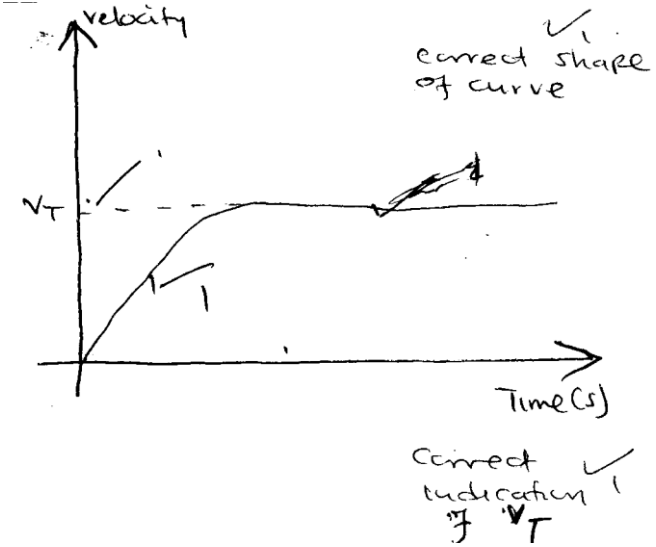
$u - \frac{MU}{3M}$

$= \frac{u}{3} ms^{-1}$ ✓1

b) i)



ii)



16. a) i) $\omega = 2\pi f$

$= 2\pi \times 10$

$= 20\pi rad\ s^{-1}$

$= 62.83\ rad^{-1}$

$T_A = M\omega^2 r - mg$

$= (1 \times 62.83^2 \times 0.5) - (1 \times 10)$ ✓1

= 19 + 3.9 – 10
= 1963.9N✓1

ii) At the lowest point
$F_c = T - Mg$
$\Rightarrow Fe + Mg$
$= mr\omega^2 + mg$
$= 1 \times 0.5 \times 62.83^2 + (1 \times 10)$✓1
= 1973.9 + 10
= 1983.9N✓1

b) i) - Electric heater is switched ✓1 on.
- Time is obtained for a certain temperature rise✓1
- Mass of block is obtained✓1

$pt = MC\theta$
$c = \frac{pt}{M\theta}$✓1

ii) $pt = MC\Delta\theta$
$\Rightarrow C = \frac{pt}{MC\Delta\theta}$
$= \frac{90 \times 15 \times 60}{2 \times (30-20)}$✓1
$= \frac{81000}{2 \times 10}$✓1
$= 4050 JKg^{-1}k^{-1}$

17. a) i) $\sum C.m = \sum A.C.M$
$40(0.25 - u) = 30 \times 20$✓1
$10 - 40u = 600$
40u - -590
$U = \frac{-590}{40}$✓1
= - 14.75N✓1
∴ u = 14.75 (acting upwards)

ii) U = wgt of liquid displaced
14.75 = mg
$= v \times \rho \times g$
Vol of liquid displaced = vol of block
$= \frac{M_b}{\rho_b}$
$= \frac{25}{1000} \times 200 = 0.00125$✓1
$\therefore 14.75 = 0.00125 \times \rho \times 10$
$\Rightarrow \rho = \frac{14.75}{0.00125 \times 10}$✓1
$= 1180 kgm^{-3}$✓1

b) i) A floating object displaces its own weight of the fluid on which it floats✓1

ii) Tension + Upthrust = weight
Upthrust = wgt of H_2O displaced
Vol. of H_2O displaced = vol of aluminium
$= \frac{Mass\ of\ aluminium}{Density\ of\ aluminium} = \frac{1}{2.7 \times 10^{-3}}$
$= 3.7 \times 10^{-4}\ m^3$✓1
Mass of $H_2O = \rho_w \times v_w$
$= [illegible]^{-4}$
$= 3.7 \times 10^{-1} kg$
∴upthrust = wgt of H_2O displaced
$= 3.7 \times 10^{-1} \times 10$
= 3.7N✓1
Since T + U = W
T = W – U
= Mg – U
T = (10 × 1) – 3.7
= 6.3N✓1