232/1 M/S

PHYSICS PAPER ONE MARKING SCHEME 2021

1. Mechanics; 1mk

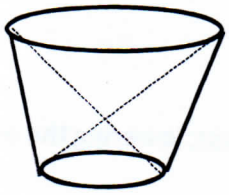
2. Zero error = -0.03cm;
Expected reading=2.48-0.03=2.45cm; 2mks

3. The block accelerates/velocity increases with time; 1mk
4. The block is acted upon by a net force due to a decrease in friction at PQ; 1mk

5. a) Thermometer T_B;
b)Cold water in A easily gain heat by convection unlike in B / cold water is denser thus sinks to the bottom of A, raising its temperature while in B hot water is less dense hence remains at the top maintaining the temperature at the top; 2mks

6. $T + mg = mv^2/r$;
$T = mv^2/r - mg$
$= 0.2x3x3/0.4 - 0.2x10$;
$= 4.5 - 2 = 2.5N$; 3mks

7.a)Stable equilibrium;
b)



; diagonals; M shown; 3mks

8. Pollen grains are in a state of continuous random motion; due to uneven bombardment/collision by the invisible water particles/molecules; 2mks

9.The drop is perfectly spherical; 1mk

10. I) To expel air from the can;
II) To condense steam back to water; 2mks

11. A partial vacuum is created inside the can on pouring cold water reducing pressure within the can; **greater pressure outside/atmospheric pressure** acting from outside forces the can to crash in; 2mks

12.a)The temperature at which the *kinetic energy of a gas particles is assumed to be zero/pressure of an ideal gas is zero.*

b)The gas would ***liquefy/solidify*** before attaining this temperature ; 2mks

13. –increase in the number of turns/coils per unit length;
-making the coils of the spring wider/larger diameter; 2mks

25MARKS

14 a If the fluid is incompressible, non-viscous and its flow is streamline, an increase in velocity lead to a corresponding decrease inits pressure; 1mk

b. As the viscous drag increases, particles in a line of flow changes direction, eventually setting in turbulent flow from streamline flow. 2mk

c. i) Volume flux = volume/time;
= 1.5 x 12/3;
= 6 cm^3/s ; 3mks

ii) $A_1V_1 = A_2V_2$ OR volume flux is constant;
6 = 0.02 x V
V = 300cm/s; 2mks

d. Air is sucked into the venturi due to action of the engine pistons; Fast moving air into the venturi cause a decrease in pressure above the petrol pipe; Petrol is drawn into the venture due to this low pressure at the venturi and the high atmospheric pressure in the float chamber; Air and petrol mixture is thus drawn into the cylinders for combustion;

15 a. Alcohol thermometer since it has a lower boiling point; 1mk

b. i. Water rises up the tube; 1mk

ii. Air within the glass loses heat and contracts faster than glass; lowering the pressure within the flask below atmospheric value; 2mks

c. Heat ice and allow it to start melting. Insert the bulb into melting ice and mark the mercury level in the bore as x; Suspends the thermometer bulb in the space above water boiling under normal atmospheric pressure, and mark the new mercury level in the bore as y; use the grid to divide the distance xy into 100 equal parts. Each of the part is a degree; and this is your graduated thermometer.
-Diagrams to be awarded 1mark. 4mks

16 a. The ratio of distance moved by Effort to distance moved by Load **at the same time**; 1mk

b. i) Load = 20 x 10 = 200N

Work done on Load = F x d

=200 x 3 ;(formula or substitution)

=600 J ; (answer) 2mks

ii) Sin 32^0 = 3/L ⟹ L =5.661m

Work done by the Effort = F x d

= 150 x 5.661 ; (sub)

= 849.2 J ; (ans) 2mks

iii) Efficiency = $\frac{\text{Work output}}{\text{Work input}}$ x 100 ;(either F or S)

= $\frac{600}{849.2}$ x 100

=70.65% ;(ans) 2mks

ALTERNATIVELLY: VR = 1/Sin Θ VR = 1/Sin 32 = 1.887

MA =L/E MA = 200/150 = 1.333

Efficiency = $\frac{\text{MA}}{\text{VR}}$ X 100 = $\frac{1.333}{1.887}$ x 100 ; (F or S)

= **70.66%** ; (ANS)

iv) W_f = 849.2 – 600 = 249.2 J ; 1mk

v) F_f W = F x d, 249.2 = F_f x d, F_f = 44N ; 1mk

17 a) Heat capacity is the quantity of heat energy needed to raise the temperature of a substance by one kelvin while latent heat of fusion is the quantity of heat energy needed to convert a (given mass of a) substance from solid to liquid without change in temperature. 1mk

b I) *to lower the pressure* in the tube making the volatile liquid to *vaporize* ; 1mk

II) Ensures the volatile *liquid circulates* in the tubing; **compresses** the vapor to **condensation**; 2mks

II) Looses heat to the pipes through **convection**; 1mk

C Heat lost by steam $Q = mL_v + mc\Delta\Theta$

$Q = 0.012 \times L_v + 0.012 \times 4200 \times (100-97)$;

$= 0.012L_v + 151.2$

Heat gained by water $Q = 0.08 \times 4200 \times 74$; $= 24864$ J

Heat gained = Heat lost;

$0.012L_v + 151.2 = 24864$

Lv =2,059,400 J/kg ; 4mks

18 a I) i. Spring balance reading **reduces**;

ii. Weighing balance reading **increases**; 2mks

II) i. Upthrust =2.7 – 2.36 = 0:34N ;

Reading = 2.80 + 0.34 = 3.14N; 2mks

ii. R.d = $\frac{\text{Weight in air}}{\text{Upthrust}}$;

$= \frac{2.70}{0.34} = 7.941$

Density = $1000 \times 7.941 = 7941 kg/m^3$; 2mks

b I. *Wide bulb* is to make the hydrometer **float;** by displacing large volume of liquid. **1mk**

Lead shorts is to make hydrometer float vertically/upright; 1mk

II The hydrometer sinks less/floats more; 1mk

19 a. Distance = Area under curve ;

Area ➡ complete squares = 32

Incomplete squares = 15/2= 7.5

Total = 32 + 7.5 = 39.5 ;

Distance = 39.5 x (2x2.5) = **197.5m** ; 3mks

(Allow for errors due to inconsistency of squares in the photocopies)

b. $V_1 = 12.5$, $t_1 = 8$ $V_2 = 25.0$, $t_2 = 16$

$a = \frac{\Delta V}{\Delta t} = \frac{25.0 - 12.5}{16 - 8}$; $= \frac{12.5}{8}$ = $1.5625 ms^{-2}$; 2mks

c. F = ma = 20 x 1.5625 ; = 31.25N ; 2mks

d. u=25m/s at P x = ut, 22.5 = 25t, t = 0.9s ;

$s = ½ gt^2$

$= ½ \times 10 \times 9^2$;

= 4.05 metres ; 3mks