வடமாகாணக் கல்வித் திணைக்களத்தின் அனுசரணையுடன்
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
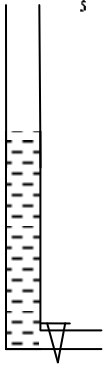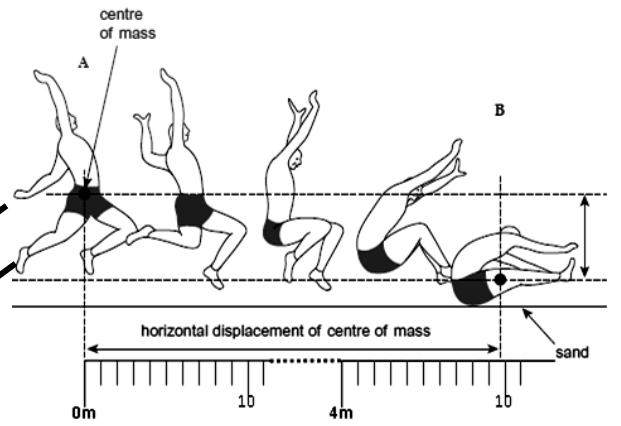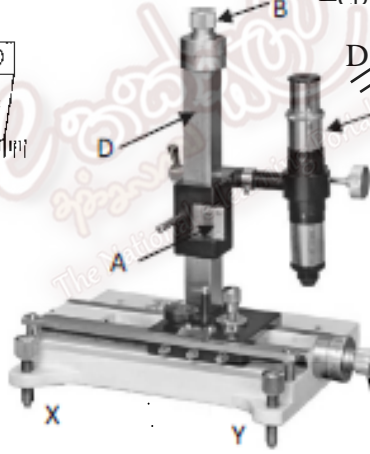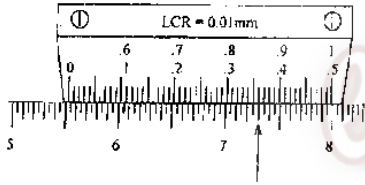**Field Work Centre**
தவணைப் பரீட்சை, மார்ச்- 2017
Term Examination, March - 2017
Physics Marking Scheme   **Grade 12(2018)**

FWC

150 mm

நீர்

h

வாய்க்காலின் குறுக்குவெட்டு

A

நீர்த்தேக்கம்

B

$L_{BC}=16m$

$d_{BC} = 200$ mm

60°

C

60° 60°

$L_{CD} = 20$ m

D

$d_{CD} = 100$ mm

$L_{CE} = 30$ m, $d_{CE} = 50$ mm

E

Oil

Water

LCR = 0.01mm

centre of mass

A

B

horizontal displacement of centre of mass

sand

0m   10   4m   10

வாய்க்காலின்

வாய்க்க

நீர்

நீர்

V

D

liquid A

h

h

liquid B

x   y

liquid C

400 N

20 mm
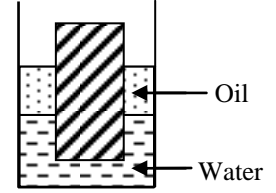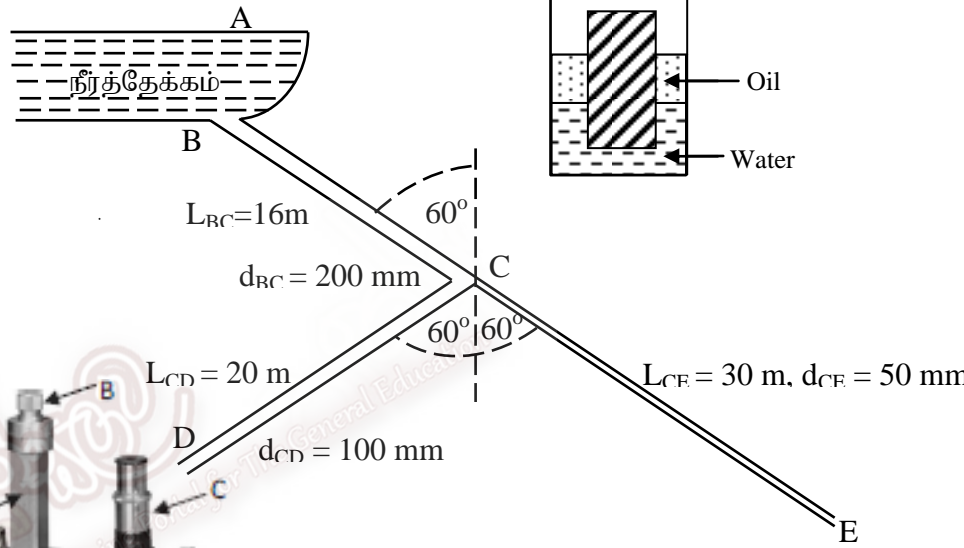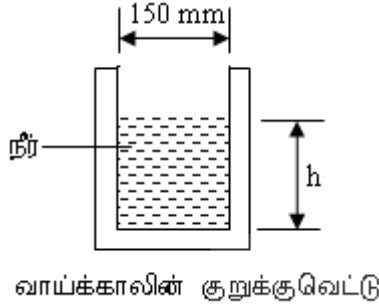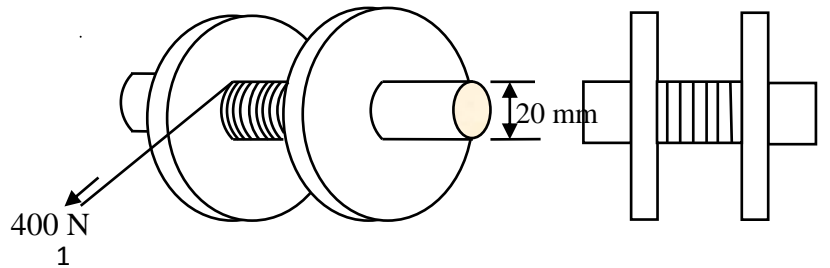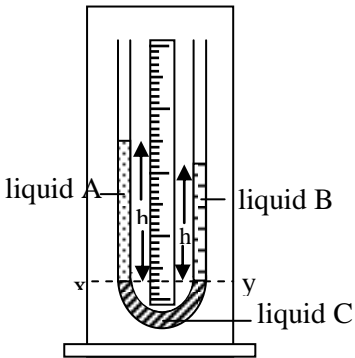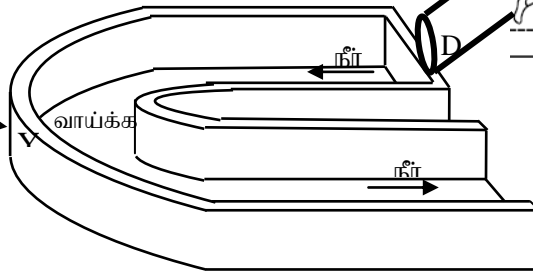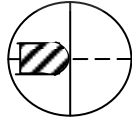
Physics
Marking Scheme - March 2017
Grade:- 12(2018)
Part I (MCQ answer)

01)	3	06)	5	11)	1	16)	4	21)	2
02)	3	07)	4	12)	2	17)	3	22)	2
03)	4	08)	2	13)	4	18)	1	23)	2
04)	2	09)	2	14)	2	19)	5	24)	3
05)	5	10)	4	15)	3	20)	1	25)	4

Part II

Structured Essay

1. (a) i) A - Vertical Vernier Scale

B - minute adjustment screw

C - microscope

D - Vertical main scale   (2)

ii) Leveling the microscope with help of the sprit level and the leveling screws(X,Y)

(1)

iii) (a) Connect one end of the capillary tube with the rubber tube and other end dip into the mercury, press and release the rubber tube.

(1)

(b) L.C = (1 - 49/50) 0.5mm = 0.01mm   (1)

(c)

(1)

(d) Reading = 55mm + 36 x 0.01mm = 55.36mm / 5.536cm   (1)

(e) m_1 - mass of the watch glass
m_2 - mass of the watch glass and mercury   } - (1)

(f) (1) water (drops) stick with inner wall of the capillary tube

(2) mass of the water thread is very small as fractional / percentage error   is high for the mass measurement / difficult to mass measurement of the water thread.   (1)

(g) fractional error = $\frac{2 \times 0.01}{40} = 0.005$ (1)

10

2

2. a.(i) The horizontal displacement of the centre of mass of the athlete from **A** to **B** = 4m 10 cm------(1)

    (ii)   The estimate error = 0.5cm ---(1)

a.   (i) for using $s = ut + {}^1/_2 \, at^2$ ↓

           $1.25 = {}^1/_2$ x $10t^2$

           t = 0.5 s --- (1)

    (ii) $v = \dfrac{4.1}{0.5}$

       $v = 8.2 \text{ms}^{-1}$ -- (1)

    (iii) $v^2 = u^2 + 2as$ ↑

        $v^2 = 2$x10x 1.25

        $v_v = 5\text{ms}^{-1}$ ---(1)

        $v_H = 8.2 \text{ ms}^{-1}$ ---(1)

b.   (i) $t = \dfrac{2\,s}{u+v}$

      $t = \dfrac{2\text{x}0.41}{8.2}$

      $t = 0.1\ s$ --(1)

    (ii) $a = \dfrac{v-u}{t}$

      $a = \dfrac{0-8.2}{0.1}$, $a = -\,82\text{ms}^{-2}$ --- (1)

    The resistive force = 75 x 82 = 6150 N --- (1)

    (iii) To avoid the rotational motion. ---(1)

$$\boxed{10}$$

3. (a) $d_1 < d_2 < d_3$ (1)

   (b) $h_1 d_1 = h_2 d_2$ (1)

   (c)   for equating the pressure due to the liquid columns A and B.   (1)

   (d) i)   Add roughly equal amount of liquid A in the respective arm at a time, thereafter add the liquid B in the respective arm until the level of the liquid C become to same horizontal level in both arms, should measure different heights of liquid A (h_1) and corresponding height of liquid B (h_2).   (2)

        ii)   less accuracy   (1)

(e) i)
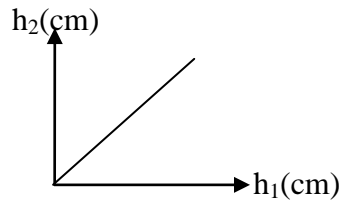
h_2(cm) vs h_1(cm) graph (1)

ii) $m = d_1/d_2$

$d_1 = 1000 \text{kgm}^{-3}$ $m = 0.8$

$d_2 = 1000/0.8 = 1250 \text{ kgm}^{-3}$ (1)

iii) $1\text{mm/h} \times 100\% = 1\%$ (1)

$h = 100\text{mm}$

$h = 10\text{cm}$ (1)

$\boxed{10}$

4. (a)   meter ruler, Rubber bung / Rubber hammer, (thermometer) (1)

(b)   Gently strike the tuning fork on the rubber bung / gently strike the rubber hammer on the tuning fork. (1)

(c)   Completely fill the tube with water, hold the vibrating tuning fork just above open end of the tube and slowly removing the water until first time maximum sound is heard. (2)
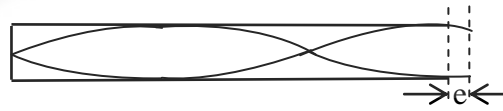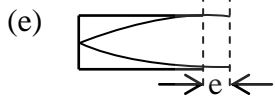
(d) i)   Air in the tube / Air molecular in the tube

    ii)   tuning fork   - (1)

(e)

(1)

(f) $\frac{\lambda}{4} = 16 + e$

$\frac{3\lambda}{4} = 49 + e$ $\lambda = 4(16.5)$

$48 + 3e = 49 + e$ $= 66\text{cm}$

$e = 0.5cm$ (1) $v = f\lambda = 500 \times \frac{66}{100}$

                                      $v = 330ms^{-1}$ (1)

(g) i.   Speed of sound : decrease

        Explanation : molecular mass of the alcohol $>$ molecular mass of air

        But $v \propto \frac{1}{\sqrt{M}}$ $M\uparrow$ $\downarrow v$ (1)
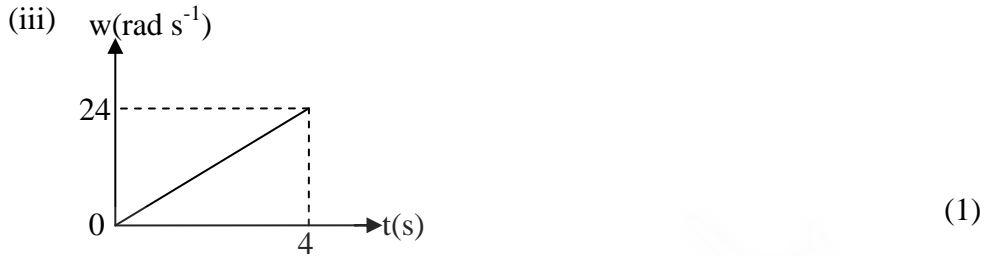
   ii.   end correction : remain constant

        Explanation : end correction of the tube depends only for the diameter / radius of the tube (1)

$\boxed{10}$

4

01) (a) (i) $\theta_f = w_0 + 1/2\alpha t^2$
$8 \times 2\pi = 0 \times t + 1/2 \times \alpha \times 4^2$
$\alpha = 6 \text{rad s}^{-1}$ (1)

(ii) $w_f = w_0 + \alpha t$
$w_f = 0 + 6 \times 4$
$= 24 \text{rad s}^{-1}$ (max. angular velocity) (1)

(iii) (1)

(iv) (1)

(v) Work = F x d
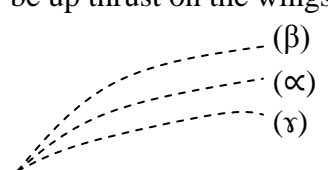$= 400 \times 2 \times \pi \times 20 \times 10^{-3} \times 8$
$= 384\text{J}$ (1)

(b) (i) $\tau = I \times \alpha$
$I = \dfrac{\tau}{\alpha}$
$= \dfrac{400 \times 20 \times 10^{-3} - 2}{6}$
$= 1 \text{Kgm}^2$ (1)

(ii) (A) $\tau = I\alpha$
$-2 = 1 \times \alpha$
$\therefore \quad \alpha = -2 \text{ rad s}^{-2}$
$\therefore \quad$ Angular retardation $= 2 \text{rad s}^{-2}$ (1)

(B) $w_f = w_0 + \alpha t$
$0 = 24 + (-2)t$ ⟋ Time spent in retardation
$\therefore t = 12\text{s}$ ⟋ Time spent in acceleration
$\therefore$ Duration of rotation $= 12 + 4$
(Time spent rest to rest) $= 16\text{s}$ (1)

5

(c) (i) Larger radius => greater torque => greater angular acceleration => takes
shorter time (for the same angular displacement)   (1)

(ii) To smooth the engine revolution.   (1)

(d) (i) Work = Sum of (Torque x angle turned)
$= 10 \times \pi/4 + 30 \times \pi/2 + ½ (30 + 10) \pi/4 + 10 \times \pi$
$= 2.5\pi + 15 \pi + 5 \pi + 10 \pi$
$= 32.5\pi$
$= 97.5J$ (1)

(ii) Out put power of sewing machine = Work done per cycle x n of cycles per sec
$= 97.5J \times 2s^{-1}$
$= 195W$ (1)

(iii) Power supplied by the motor to the sewing machine $= \dfrac{195W}{78\%} \times 100\%$
$= 250W$ (1)

(iv) Power drawn from the mains by the motor $= \dfrac{250W}{40\%} \times 100\%$
$= 625W$ (1)

(v) Consumption of electrical energy = Power in kW x time in h
$= \dfrac{625}{1000}$ kW x 2000h
$= 1250kWh$ (1)

$$\boxed{15}$$

02) (a) (i) - Streamline flow
- nonviscous
- incompressible   (1)

(ii) $P + \frac{1}{2}pv^2 + hpg = $ constant
identification of the symbols or terms   (1)

(iii) ($\propto$) increase
(β) decrease   (1)

(iv) speed of airstream above the wing > speed of air stream below the wing
∴ air pressure above the wing < air pressure below the wing hence, there would
be up thrust on the wings   (1)

(v)

------ (β)
------ ($\propto$)
------ (γ)

the paths for (β) and (γ) should be above and below the path for ($\propto$) respectively) (1)

6

(b) (i) ($\propto$) A → D

$$P_A + \frac{1}{2}Pv_A{}^2 + 25pg = P_D + \frac{1}{2}Pv_D{}^2 + 5pg \qquad (1)$$

$$V_D{}^2 = 40g = 400 \quad (V_A = o, P_A = P_D)$$

$$V_D = 20ms^{-1} \qquad (1)$$

(β) A → E

$$P_A + \frac{1}{2}Pv_A{}^2 + 25pg = P_E + \frac{1}{2}Pv_E{}^2 + 0 \times pg$$

$$V_E{}^2 = 500$$

$$V_E = 10\sqrt{5}$$

$$= 22.4ms^{-1} \qquad (1)$$

(ii) $\pi\frac{(200\times10^{-3})^2}{4} V_{BC} = \pi\frac{(100\times10^{-3})^2}{4} \times 20 + \pi\frac{(50\times10^{-3})^2}{4} \times 22.4$ (1)

$$V_{BC} = 6.4ms^{-1} \qquad (1)$$

(c) (i) Volume rate of delivery to canal $= \pi\frac{(100\times10^{-3})^2}{4} \times 20$

$$= 0.15ms^{-1} \qquad (1)$$

(ii) h x 150 x 10^{-3} x 20 = 0.15

    h = 0.05m or 5.0cm   (1)

(iii) mass rate of flow = 0.15 x 1000

            = $150kgs^{-1}$ (1)

(iv) Thrust = mass rate of flow x change in velocity   (1)

        = 150 x [20 − (−20)]

        = 6000N   (1)

15

03) (a) The sudden breaking of rock within the earth or an explosion   (1)

(b) The energy releasing point of the earthquake   (1)

(c) The point on the earth's surface directly above the focus is earthquake's epicenter (1)

(d)

	P - waves	S - waves
1.	longitudinal waves	transverse waves
2.	high speed	low speed
3.	travel through	travel through
	solid or fluid	only solid / do not exist in a fluid

                                 only two correct provide   **(1)**

                                 all three are correct provide   **(2)**

(e) The distance of the epicentre from recording station is d. (say)

$$\frac{d}{3kms^{-1}} - \frac{d}{5kms^{-1}} = 50s \qquad (1)$$

$$d\frac{[5-3]}{15} = 50$$

$$d = 375km \qquad (1)$$

(f) Richter scale   (1)

(g) i.   Under water earthquakes
    ii.   transverse waves $\Big\}$ (1)

(h) i. $720 \text{kmh}^{-1} = \frac{720 \times 1000}{3600} \text{ms}^{-1}$
                $= 200 ms^{-1}$
       $V = \sqrt{\text{gh}}$
      $200 = \sqrt{10 \times h}$
    $10h = 200 \times 200$
        $h = 4000\text{m}$
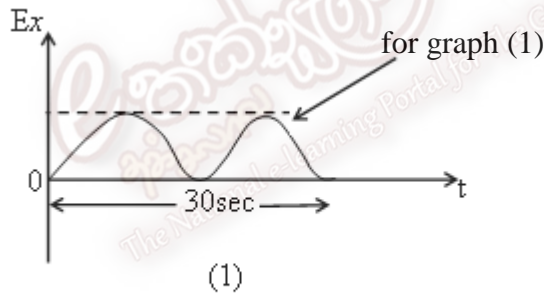 $= 4\text{km}$ (1)

    ii. $T = \frac{\lambda}{v}$
         $= \frac{6 \times 10^3}{200}$
         $= 30 sec$ (1)

    iii. $\omega = 2\pi f = \frac{2\pi}{T} = \frac{2 \times 3}{30} = 0.2 \text{ rads}^{-1}$ (1)
       $V = A\omega$
       $A = \frac{V}{\omega} = \frac{0.4}{0.2} = 2\text{m}$ (1)

    iv.

for graph (1)

(1)

15

Part I   = 25 x 2 = 50

Part II Structure   4 x 10 = 40

      Essay   2 x 15 = 30

Final Marks $= Part(\,I\,)marks + \dfrac{Part\ (II)\ marks}{7}$ x 5