MARKING SCHEME

OPENER EXAMINATION: TERM 1 2024

PHYSICS

FORM 3

Time: 2 Hours

SECTION I (25 MKS)

1. **Micrometer screw gauge**

2.

i) Volume of solid in cm^3

Volume = V$_2$ – V$_1$

= 80 - 60

= 20

ii) Density of the solid in SI unit (give your answer to 1 decimal place)

Density = Mass/volume
=10/20
=0.5

3.

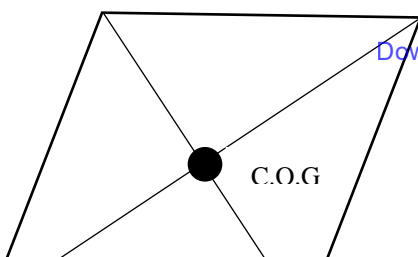**Higher atmospheric pressure than normal/standard**

Presence of impurities

4.

Steel needle floats due to surface tension force.

Detergents reduce surface tension, so the needle sinks.

5.

C.O.G

6. Determine the weight of the metre rule. (2mks)

Clockwise moment = Anticlockwise moment

Wx0.2 = 2 x 0.25

W = 2.5N

7.

Due to diffusion. Gas molecules moved from where concentration was higher to other areas where gas molecules concentration was low.

8.

F= Ke

K = 125N/M

e = 20cm

= 0.2m

F = 125 x 0.2

= 25N

9.

Pressure = Phg + P air

P air = 760mmhg – 600mmhg

= 160mmhg

10.

a)

Thermometer B

b) Give a reason for your answer in (a) (2mks)

Hot water rises due to reduced density. Remains at top because of conventional currents.

11.

In (a) cohesive forces between water molecules are greater than adhesive forces between water and wax while in (b) adhesive forces between water and glass molecules are greater than cohesive forces between water molecules.

12.

$A_1V_1 = A_2V_2$

$\Pi \times 6^2 \times V_1 = \Pi \times 9^2 \times 2$

$V_1 = 4.5\text{m/s}$

25km/h

Section B(55mks)

13. a)

i)

Oil is immiscible with water

Oil is less dense than water hence float on the water surface

(ii)

For clear visibility of the oil pitch boundary.

(iii)

The pitch is a monolayer

The oil drop is spherical (perfect sphere)

The pitch is a perfect circle

Patch is a perfect cylinder

(iv)

The oil breaks the surface tension hence molecules of water pulls away

b)

i)

vol of 1 drop = 15
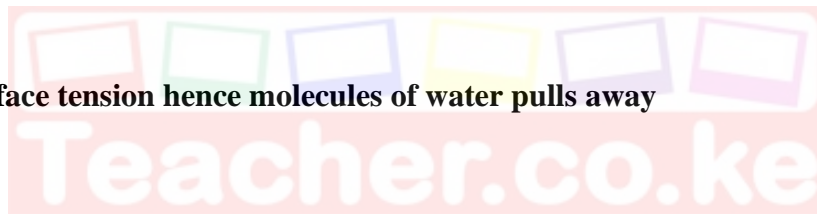   **100**

$$= 0.15 \text{mm}^3$$

ii)

V = Ah

h = 0.15
   8.0 x 10⁴

h = 1.875 10 ⁻⁴ mm

14 a) Efficiency is ratio of MA to VR expressed as a percentage.

b) A block and tackle system has 3 pulleys in the upper fixed block and 2 in the lower movable block. The

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system is used to lift a load L using effort E.

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Draw a well labeled diagram to show the arrangement of system where the effort E is used to lift load L. (3mks)

ii)

V.R = 5

c)

i)

M.A = load
      Effort

$\dfrac{4.5 \times 10^3}{135}$

M.A = 33.3

ii)

e = M.A x 100
    V.R

$\dfrac{33.3 \times 100}{45}$

e = 74%

iii)

% work wasted = 100% - 74%

= 26%

15. a)

  i.   Mass

  ii. Temperature

b) i) **Air less dense than water**

ii) **As it rises the pressure around the bubble reduces and since temperature is the same, volume increases.**

c) i)

To trap the air column

To dry the gas

ii)

Temperature of water as the temperature of air column

Length of air column as volume of air column

d)

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{750}{283} = \frac{V_2}{373}$$

$$V_2 = \frac{375 \times 750}{283}$$

$$V_2 = 988.5cm^3$$

16. a)

Heat capacity – Quantity of heat energy required to raise the temperature of a given mass of a material by one degree Celsius or one Kelvin.

C = Q/Ø

S.H.C = Quantity of heat required to raise the temperature of a unit mass by one degrees Celsius or by one Kelvin (1K)

b)

i)

    i.   **Time of heating**

    ii.   **P.d across the heating coil**

    iii.   **Mass of the copper block**

    iv.   **Temperature**

    v.   **Current**

ii)

To enhance thermal contact between the thermometer/heater and block.

c)

i)

H = Vit

= 12 x 4 x 10 x 60

= 28800J

ii)

Q = MCØ

= 2 x C x (75 – 25)

100C joules

Alternatively

Heat supplied = Heat gained = 28800J

iii)

Vit = MCØ

28800 = 100C

C = $\frac{28800}{100}$

= 288J/KgK

d)

1. Temperature
2. Surface area
3. Draught
4. Humidity