NAME.....Class..... Adm No.....

232/1
PHYSICS PAPER 1
TIME: 2 HOURS

XXXXXX **NAME OF THE SCHOOL** XXXXX

INSTRUCTIONS TO THE CANDIDATE:

(a) Write your **name** and **index number** in the spaces provided above.
(b) **Sign** and write the **date** of examination in the spaces provided above.
(c) This paper consists of **two** Sections **A** and **B**.
(d) Answer **all** the questions in sections **A** and **B** in the spaces provided.
(e) All working **must** be clearly shown in the spaces provided.
(f) Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used.

FOR EXAMINER'S USE ONLY:

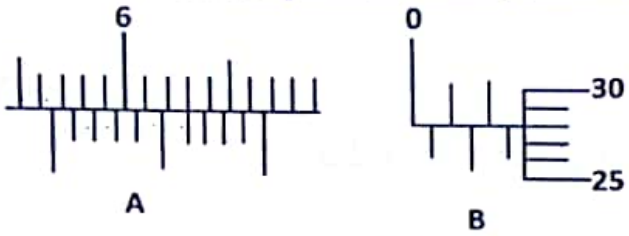
Section	Question	Maximum Score	Candidate's Score
A	1-8	25	
B	9	9	
	10	7	
	11	9	
	12	12	
	13	8	
	14	10	
Total Score		80	

SECTION 25 MARKS

1. What you understand by the term SI unit. (1 mark)

Systeme International de unit

2. Form four students used two measuring instruments to measure two quantities A and B as shown below



Given that **A - 2B = K** calculate the value of K. Express your answer SI unit. (4 mark)

QN STF

A 5·6
0·06
5·66cm

B 2·5
0·28
2·78mm

2B = 5·56mm
= 0·556cm

2·780
- 0·556
2·224mm

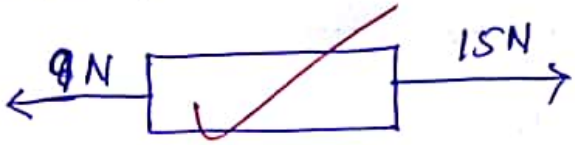
2.224×10^{-3} M

3. With a help of a diagram show how 15N force and 9N force can have a resultant force of

i. 24N (1 mark)

Forces in the same direction

ii. 6N (1 mark)



Forces in opposite direction

4. State how a thermometer can better

a. Quick action (1 mark)

making thin walled bulb thinner

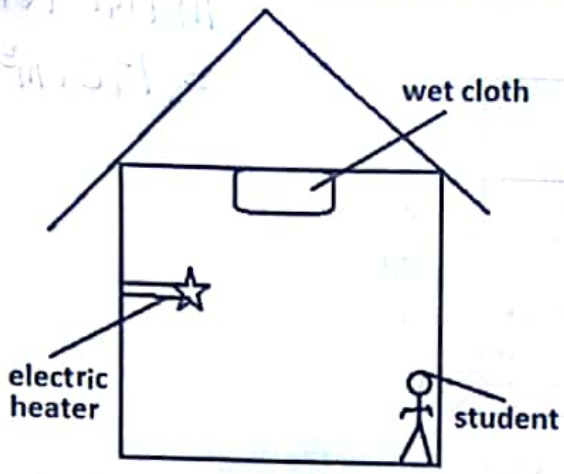
b. Accuracy (sensitive to small changes in temperature) (1 mark)

making narrow bore narrower

comparative terms must be used

9

5. The diagram below shows a cross-section of a house. Electric heater is on, wet cloth is hanged on the roof and a student is standing near one wall of the house.



State the mode of heat transfer through which

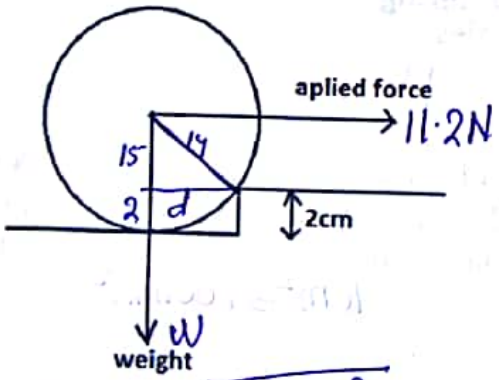
a. Wet cloth is getting heat (2 mark)

convection
Radiation

b. Student is not getting heat (2 mark)

conduction
convection

6. The figure below shows a cylinder of radius 17cm being pulled by horizontal force against a step 2cm high. If a force of 11.2 N is just sufficient to turn the drawn so that it rises over the step, calculate its weight (3 mark)



$d = \sqrt{17^2 - 15^2}$

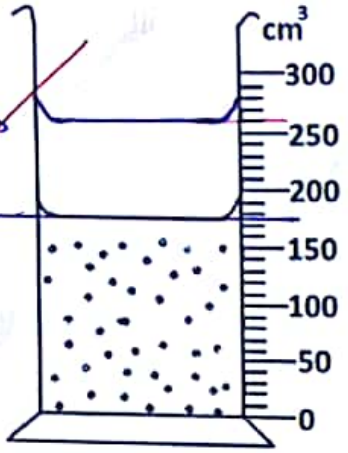
$= 8$

$F_1 d_1 = F_2 d_2$

$11.2 \times 15 = W \times 8$

$W = 21\ N$

7. The diagram below shows a measuring cylinder with water.



with a meniscus

Initial volume = 170cm³ or 180cm³

- 180 ✓
- 170 ✓
- 170 or 180 X
- 175 X

15 metal balls are gently lowered. Show on the diagram the final volume of water if the metal balls have a density of 1200kg/m³ and the mass of each ball is 7.2g. (4 mark)

$V = \frac{m}{\rho}$

$= \frac{7.2g}{1.2g/cm^3}$

$= 6cm^3$

$15 \times 6 = 90\ cm^3$

Final volume = 170 + 90

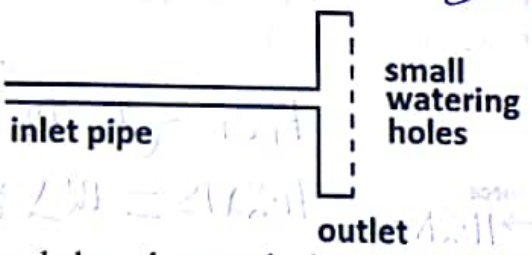
= 260 cm³

8. .

a. Define pressure and state its SI unit (2 mark)

Force acting perpendicularly per unit area

Newton/(metre)²



b. The diagram below shows a device used for watering crops out let has N number of holes. Inlet has a cross-section area of 2.4cm² and water flows at 15m/s. calculate the number of small holes if each hole has a cross-section area of 3mm² and water come out at 25m/s. (3 mark)

$1cm^2 = 100mm^2$

$A_1 V_1 = n A_2 V_2$

$24 \times 15 = n \times 3 \times 10^{-2} \times 25$

$n = 48$ holes

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+ve → Trailer −ve ← Bus let → be positive

SECTION 55 MARKS

9.

a. A trailer of mass 30000kg travelling at a velocity of 20m/s collide with a bus of mass 10000kg travelling at 10m/s in the opposite direction. The impact takes 0.5 seconds before the two vehicles move off together at a constant velocity for 15 seconds. Determine.

i. The common velocity. (3 mark)

$m_1v_1 + m_2v_2 = (m_1+m_2)V$

$30,000 \times 20 + 10,000 \times -10 = (30,000+10,000)V$

$600000 - 100,000 = 40,000V$

$V = 12.5 m/s$

ii. The impulsive force on the trailer on impact. (3 mark)

$F = \frac{mv - mu}{t}$

$= \frac{30,000 \times 12.5 - 30000 \times 20}{0.5}$

$= -450,000N$

OR

$a = \frac{v-u}{t}$

$= \frac{12.5-20}{0.5}$

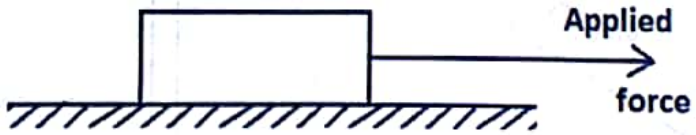
$= -15 m/s^2$

$F = ma$

$= 30000 \times -15$

$= -450000 N$

b. An wooden block of mass 600g is pulled along a horizontal bench with a constant force as shown below



If the block accelerate at $2m/s^2$ and coefficient of friction between the block and the table is 2.5 calculate applied force. (3 mark)

applied force = F = ma + friction

Friction = μ × R

$= 2.5 \times \frac{600}{1000}$

$= 1.5N$

$F = ma$

$= \frac{600}{1000} \times 2$

$= 1.2N$

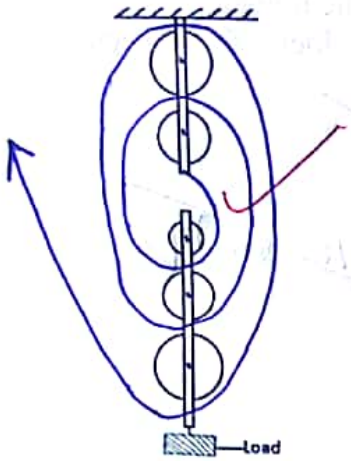
applied = 1.5 + 1.2

$= 3.7N$

9

10.

a. The diagram below shows a block and tackle. Show on the diagram the path string passes through the pulleys and state velocity ratio (2 mark)



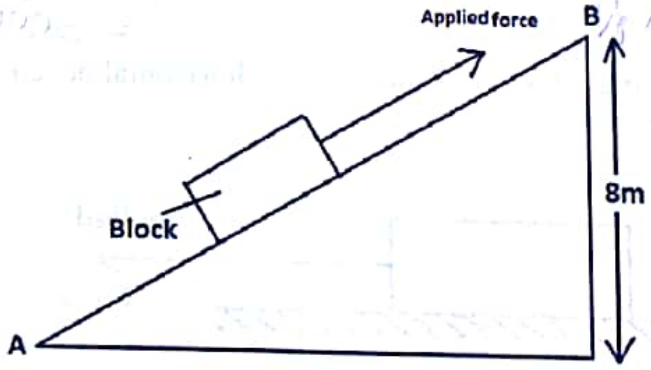
VR = 6

b. Define a transducer, give one example that illustrate how it work (2 mark)

Device that convert energy from one form to onother

electric bulb converts electrical to light

c. A block of weight 120N is pulled along an inclined plane using a steady force as shown below



If distance AB is 25m and work done against friction is 240J calculate the value of applied force (3 mark)

Input = $\underset{\text{output}}{mgh}$ + friction

$mgh = 120 \times 8$

$= 960\ J$

Input $= 960 + 240$

$= 1200\ J$

Input $= F \times d$

$1200 = 25F$

$F = 48N$

11.

a. State pressure law (1marks)

Pressure of a fixed mass of a gas is directly proportional to its absolute temparature provided volume is kept constant

b. In an experiment to verify Charles laws state two quantities that are kept constant. (2marks)

- mass of gas
- pressure

c. A balloon seller has a cylinder containing hydrogen of volume $3.0m^3$ at a pressure of 2.6×10^5 N/m^2 at 27^{0}C he sells a balloons of volume $1250cm^3$ at a pressure of 1.04×10^5 N/m^2 at 27^{0}C. Calculate the number of balloons he can sell. (3marks)

$1m^3 = 1\times10^6 cm^3$

$P_1V_1 = nP_2V_2$

$3.0\times2.6\times10^5 = n\times1250\times10^{-6}\times1.04\times10^5$

$n = 60$ balloons

d. Calculate the maximum pressure of a glass block of density 2500kg/m^3 would exert on a horizontal surface, if the block measured 30 x 12 x 20cm. (3marks)

$V = 7200cm^3$

$m = 7200\times2.5$

$= 18,000g$

$W = mg$

$= 180N$

$P_{min} = \frac{F}{A_{max}}$

$= \frac{180}{30\times20}$

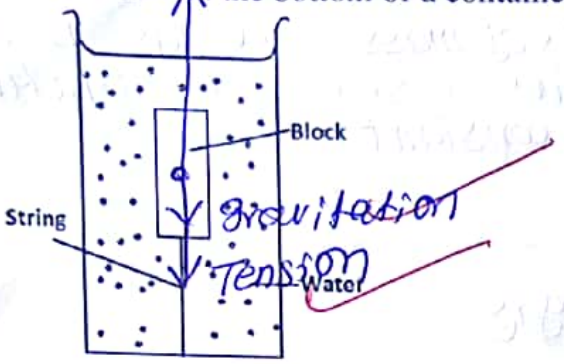
$= 0.3N/cm^2$

$3000N/m^2$

9

12..

a. A rectangular block is held at the bottom of a container by a string as shown below



On the diagram show the forces acting on the bock (3marks)

b. If density of water is 1000kg/m^3 and the block has a volume of 750cm^3 and a density of 0.8g/cm^3 calculate the value of each force. (3marks)

Weight $= mg = \rho \times V \times g$

$= \frac{750 \times 800 \times 10}{1000000}$

$= 6\,N$

Upthrust $= W_{wd}$

$= \rho V g$

$= \frac{1000 \times 750 \times 10}{1000000}$

$= 7.5\,N$

Tension $=$ Upthrust $- mg$

$= 7.5 - 6$

$= 1.5\,N$

c. An object weighs 1040g in air, 640g when fully immersed in water and 720g when fully immersed in a liquid. If the density of water is 1000kg/m3, find the density of the liquid. (3marks)

$RD = \frac{W_a - W_L}{W_a - W_w}$

$= \frac{1040 - 720}{1040 - 640}$

$= 0.8$

$\rho_{liquid} = RD \times \rho_{water}$

$= 0.8 \times 1000$

$= 800\,kg/m^3$

d. In a hydrometer what is the purpose of

i. Lead shots. (1marks)

make it float when it is vertical

ii. Narrow stem (1marks)

make it sensitive to small change in density

iii. Wide bulb (1marks)

make it have enough upthrust

12

13. A copper of heat capacity 600J/K contains 200g of water at 20^0C. Dry steam at 100^0C is passed through the water while stirring until it reaches a final temperature of 60^0C. Given that specific heat of capacity of water as 4200J/Kgk and specific latent heat of steam as 2260,000 J/kg

a. Heat absorbed by water (2 marks)

$Q = mc\Delta\theta$

$= \frac{200}{1000} \times 4200 \times (60-20)$

$= 33,600J$

b. Heat absorbed by calorimeter (2 marks)

$Q = C\Delta\theta$

$= 600(60-20$

$= 24,000J$

c. Write an expression on heat lost by steam heat lost by steam (2 marks)

condensation + cooling

$Mx L_v + mc\Delta\theta$

$2260000 \times \frac{m}{1000} + \frac{m}{1000} \times 4200(100-60)$

$2260m + 168m$

$2428m$

d. Calculate the mass of the steam condensed (2 marks)

$33600 + 24000 = 2428m$

$m = 23.72g$

8

14.

a. Explain why a body moving in a circular path at constant velocity is said to be accelerating. (1 marks)

there is change of direction per unit time and velocity is a vector quantity

b. A stone is projected horizontally from top of a cliff with initial horizontal velocity of 20m/s if the stone land s 100m from the bottom of the cliff, calculate height of the cliff. (3 marks)

$t = \frac{\text{Range}}{\text{velocity}}$

$= \frac{100}{20}$

$= 5\ s$

$H = ut + \frac{1}{2}gt^2$

$= 0 + \frac{1}{2} \times 10 \times 25$

$= 125\ m$

c. A string of negligible mass has a bucket tied at the end. The string is 70cm long and the bucket has a mass of 450g. The bucket is swung horizontally making 8.4 revolutions per second. Calculate

i. The linear velocity. (3 marks)

$2\pi f = \frac{V}{r}$

$2 \times \frac{22}{7} \times 8.4 = \frac{V}{0.7}$

$V = 36.96\ m/s$

ii. The tension on the string. (3 marks)

$T = m\omega^2 r$

$= \frac{450}{1000} \times (52.8)^2 \times 0.7$

$= 878.12\ N$

$\omega = 2\pi f$

$= 52.8$

Or $F = \frac{mv^2}{r}$

$= 0.45 \times \frac{(36.96)^2}{0.7}$

$= 878.12\ N$

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