**ALLIANCE HIGH SCHOOL -2016**

**TRIAL EXAMINATIONS**

**PHYSICS PAPER 1**

**MARKING SCHEME**

SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided

1. When pollen grains are placed in water and absorbed through they are seen to exhibit a random motion. Account for the random motion. (2 marks)

*The movement is due to the pollen grains being bombarded by water molecules*

1. A drug manufacturer gives the mass of the active ingredients in a table as 5mg. express this quantity in SI standard form. (2 marks)

$$5.0 × 10^{-6 }kg $$

1. The figure below shows a micrometer screw gauge being used to measure the diameter of a metal rod. The reading on the gauge when the jaws were fully closed without the rod was 0.014 cm.

10

10

10

30

25

What is the actual diameter of the rod (2 marks)

$$m.s=11.5$$

$$s.s=0.032$$

$$11.82 mm$$

$$error 0.14.mm $$

$$11.68 mm$$

1. The figure below shows a sheet of paper rolled into a tube

 Paper tube

 When a stream of air is blown into the tube as shown into the diagram, the paper tube collapses. Explain the observation.

* The velocity of air inside is high hence lowers the pressure inside. The greater pressure outside makes the paper to collapse.
1. A spiral spring stretches by 0.6 cm when a mass of 300g is suspended on it. Calculate the work done in stretching the same spring by 4 cm

$$f=ke $$

$$k=\frac{f}{e}=\frac{3}{0.006m }=500N/m $$

$$w.o=\frac{1}{2}ke2$$

$$=\frac{1}{2}×500 ×\left(0.04\right)2= 0.4j$$

1. The figure below shows a device for closing a steam outlet the area of the piston is $8.0 ×10^{-14}m^{2}$and the pressure of the steam I the boiler is$ 2.0 ×10^{5}Nm^{2}$ . Determine the weight W that will just hold the bar in the horizontal position shown. (3 marks)



$$force=p ×a $$

$$=2 ×1^{-5}×8 × 10^{-4}$$

$$=2 ×10 ×8=160 n $$

$$sum cm=sum acm $$

$$15 ×160 n=60 ×w $$

$$w=\frac{15×160}{60}=40 n$$

1. Study the diagram below from the diagram



Determine the pressure at point Q due t the liquid column (3 marks)

 $pressure at p=pressure at Q $

$$=0.16 ×1000 ×10$$

$$=1600PA$$

1. When the gas is turned on it above the wire gauge, the flame stays above the wire gauge for sometimes. Explain the observation. (2 marks)
2. A pendulum bob is pulled to one side until it is at vertical height of 40 cm above its lowest position. The bob is then released. Find its speed as it swings through its lowest position

$$\frac{1}{2}mv^{2}=mgh$$

$$\frac{1}{2}× v^{2}=0.4 ×10$$

$$v^{2}=2 ×0.4 ×10$$

$$v^{2}=8$$

$$v=2.828m/s$$

1. A ballon filled with organ gas a volume of $200 cm^{3}$at the earth’s where the temperature is $20° C, and the pressure 760 mm of mercury.if it is allowed$to ascend to a height where the temperature is 0° c and the pressure 100mm of mercury, calculate the volume of the ballon (3 marks)

$$\frac{P\_{1}V\_{1}}{T\_{1}}= \frac{P\_{2}V\_{2}}{T\_{2}}$$

$$V\_{1}=200 CM^{3}$$

$$T\_{1}=293$$

$$P\_{1}=760 MMHG $$

$$P\_{2}=100 MMHG $$

$$T\_{2}=273 K$$

SECTION B (55 MARKS)

1. a) State the law of floatation. (1 mark)

A body displaces its own weight in the fluid in which it floats

1. The figure shows a rectangles body of mass 10 kg tethered to the sea – bed by wire. The dimensions are 3m by 2m by 1.8m



Calculate the:

1. Weight of the sea water displaced by the body (density of sea water = 1030 kg/m3)

Volume of displaced water = (3 x 2 x 0.6) = 3.6 m3

Mass of displaced water = 3.6 x 1030 = 3708 kg

1. Upward force exerted on the body by the water. (2 marks)

Upwards force = 37080 N

1. Tension in the wire (2 marks)

Tension = 37080 – 100 = 36980 N

1. A test tube of mass 20g and uniform cross – section area 4cm2 is partially filled with lead shots to float vertically in water with 10cm of its 10cm of its length submerged.

Drawing



Find the:

1. Mass of the lead shots. (3 marks)

 Volume of displaced water = $4= cm^{2} ×10 cm=40 cm^{3}$

 Mass of displaced water $=40cm^{3} ×151 cm=405 cm^{3}$

Weight of display = 0.4N

1. Length of the test tube that would be submerged in a liquid of density 0.8g/cm3 (2 marks)

Weight of test tube + lead slots = 0.4 n

Mass of liquid displaced = 40 g

Mass = ex v

40 = 0.8 x v

V 40/0.8 = 50 cm3

12. A bullet of mass 20g is fired horizontally with a velocity of 200m/s in a suspended stationary wooden block of 1980g. Determine

1. The common velocity of both the bullet and the block if the bullet is embedded into the block

Momentum before collision = Momentum after collision

0.02 x 200 = 2 x v

4 = 2 v

2 m/s = v

1. The height to which the block rises. (3 marks)

Mgh = ½ mv2

10 x h = ½ x 22

10h = 2

h = 0.2m

1. If the block was loosely held at the height of 10 m above the ground and the string snaps during impact far will the block travel before hitting the ground (4 marks)

$$s=\frac{1}{2}g+2 $$

$$10=\frac{1}{2}× t2$$

$$t2=2s$$

$$t=1.414s $$

$$s=ut $$

$$=1.414 ×2$$

$$=2.828m $$

13. (a) State one reason why a burn from steam at 100° c is more severe than a burn

from boiling water at the same temperature (2 marks)

Steam at 100° C has more energy because it has talent heat of vaporization as opposed to water at 100°C which doesn’t posses latent heat of vaporization.

(b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100°C was passed into water contained in a well – lagged copper calorimeter. The following measurements were made:

Mass of calorimeter = 52 g

Initial mass of water 71 g

Final mass of calorimeter + water + condensed steam = 126g

Final temperature of mixture = 35°c

Initial temperature of water = 12° c

(Specific heat capacity of water = 4.2 j g-1 k and specific heat capacity for copper = 0.4 J-1 k-1)

Determine the

1. Mass of condensed steam (1 mark)

Mass of steam = 3g

1. Heat gained by the calorimeter and water (3 marks)

Heat gained by calorimeter = MCDO

= 0.052 x 400 x (135 – 12)= 478.25

Heat gained by water = MCDO

= (0.071 x 4200 x 23) = 6858.65)

Total heat = 6858.6 + 478.2 = 7336.8J

1. Given that L is the specific latent heat of evaporation of steam
2. Write an expression for the heat out by steam (2 marks)

Heat given out by steam

0.003 l + (0.003 x 4200 x (100 – 35)

= 0.003l + 819 j

= 0.003 l +819

1. Determine the value of L. (3 marks)

Heat given out by steam = heat taken in water + calorimeter

0.003 l +819 = 7336.8

0.0003 l = 6517.8

L = 2172600 J

14. a) Define angular velocity and state it SL units (1 mark)

 Rate of change of angular displacement

 SI units rod / s

1. A student tied a 0.060 kg mass to the end of a string 0.03 m long and whirled it

 around a horizontal circle of radius 0.015 m with a speed of 2m/s-1. Determine the centripetal acceleration of the body. (2 marks)

$$ac=\frac{v2}{r}=\frac{2^{2}}{0.015}=266.67\frac{m}{s2}$$

 c) A centrifuge is used to separate blood cells from blood plasma rotates at 55

revolutions second. What is the angular velocity of a centrifuge tube 8.0 cm from the centre of rotation. (3 marks)

$$2 ×πf$$

$$2 ×π ×55=110π rods/s $$

 $=110 ×3.14=345.4\frac{rod}{s}$

 d) A bullet is fired horizontally from a platform 30 m high. If the initial velocity is 60ms-1. Determine the range of the bullet (3 marks)

$$s=\frac{1}{2}s+2$$

$$30=\frac{1}{2}×10×t2$$

$$5t2=30$$

$$t2=6$$

$$t=2.4495=range ut=2.449 ×60=146.96 m $$

 e) Explain why a body moving with uniform circular motion is said to be accelerating (2 marks)

 There is change in velocity dues to change in direction.

15. Fig 3. Shows part of an experimental set up of estimating the diameter of an oil molecule



1. Describe how the oil patch is formed (2 marks)

A drop of oil put on the water surface and allowed to spread

1. Why was lycopodium, powder used in the experiment (1 mark)

To make the path visible

1. In an experiment, the diameter, D, of the patch was measured to be 400 mm for an oil drop of radius 0.50mm. Determine the diameter of the molecule of the oil.

 (4 marks)

Volume of the patch = volume of the oil drop

$$A=πr^{2}h=\frac{4}{3}×(0.5)^{3} $$

$$4.0 × 10^{4}h=0.16667$$

$$h=4.167× 10^{-6 }mm or 4.167 × 10^{-9 }mm$$

1. State two assumptions made in your calculations (2 marks)

The oil patch is monolayer

The oil drop is a perfect sphere