**PATHWAY EVALUATION EXAMINATION**

**PHYSICS COMBINED PAPER**

**FORM 1 END TERM 2**

**MARKING SCHEME**

1. (a) Identify **four** branches of physics. (4 marks)

* Mechanics
* Electricity
* Magnetism
* Thermodynamics
* Optics
* Waves
* Particle physics
* Nuclear physics
* Plasma physics

**Any 4**

(b) Name **four** career opportunities whose foundation is physics. (4 marks)

* engineering
* geology
* astronomy
* surveying
* meteorology
* medicine

1. (a) Define the following terms as used in measurement. (4 marks)
2. Density

**Mass per unit volume of a substance.**

1. Mass

**Quantity of matter contained in a substance.**

1. Accuracy

**Closeness of a measurement to the correct value of the quantity being measured.**

1. Error

**Deviation of measurement to the correct value being measured.**

(b) Explain two factors that affect surface tension. (4 marks)

* Impurities. Reduce the surface tension of the liquid.
* Temperature. Rise in temperature reduces tension by weakening inter-molecular forces.

1. 1000 cm 3 of fresh water with density of 10 000 kgm-3 is mixed with 1000 cm3 of sea water whose density is 30 000kgm-3.

Calculate:

1. The mass of fresh water (2 marks)

**Mass = density × volume**

**Mass of fresh water = 10 000 × 0.001 = 10 kg**

1. The mass of sea water. (2 marks)

**Mass of sea water = 10300× 0.001 = 10.3kg**

1. Mass of the mixture. (2 marks)

**Mass of mixture = 10 + 10.3= 20.3kg**

1. Volume of the mixture in m3. (2 marks)

**Volume of mixture = 1000 + 100 = 2000 cm3**

=0.002m3

1. The density of the mixture. (2 marks)

**density = mass / volume = 20.3/ 0.002**

**=10,150kg/m3**

1. (a) Name the type of force: (4 marks)
2. That allows for attraction between two bodies of given masses.

**Gravitational force**

1. Which is an upward and acting on objects immersed in a fluid.

**Upthrust force**

1. Which involves attraction or repulsion of static charges.

**Electrostatic force**

1. Which constrains a body to move in a circular path.

**Centripetal force**

(b) An astronaut weighs 90N on earth. In the moon, he weighs 150N. taking g=10 N/kg, calculate the moon’s gravitational strength. (3 marks)

**Moons’ gravitational strength = weight of astronaut on the moon / mass of astronaut.**

**= 150 / 90 = 1.67 Nkg-1**

1. The length of a spring is is 20.0cm. its length becomes 24.0 cm when supporting a weight of 5.0N. Calculate the length of the spring when supporting a weight of:
2. 3.0 N (3 marks)

**5N causes an extension of 4.0 cm, therefore 1.0N causes an extension of 4 /5 = 0.8cm.**

**3.0 N => 3.0 × 0.8 = 2.4cm**

**therefore length becomes = 20.0 + 2.4 = 22.4 cm**

1. 120N (3 marks)

**6N causes an extension of 4.0 cm, therefore 1.0N causes an extension of 4 /5 = 0.8cm.**

1. **N => 120 × 0.8 = 96 cm**

**therefore length becomes = 20.0 + 96 = 116.0cm**

1. (a) Giving two examples in each case, distinguish between vector and scalar quantities. (4 marks)

(b) A rectangular brick of weight 20N, measures 25 cm × 15 cm × 10 cm. calculate:

1. Area of the smallest face in m2. (2 marks)

Area of the smallest face = 15×10 = 150 cm2

=0.015 m2

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1. Area of the largest face in m2. (2 marks)

Area of the largest face = 0.25 × 0.15 = 0.0375 m2

1. Value of the maximum pressure exerted by the block resting on a horizontal table. (2 marks)

Maximum pressure = 20 N / 0.015 =133.3 × 102N/m2

1. Value of the minimum pressure exerted by the block when resting on a horizontal table.

(2 marks)

Minimum pressure = 20 N / 0.0375= 533 N/m2

(b) Other than the unit used in above, identify the other unit for measuring pressure. (1 mark)

**Bar**

1. (a) The experiment below was done by form 1 students.

**Ball and ring experiment**

Procedure

-Obtain a ball and ring apparatus bigger than the size of the ball.

-Pass the ball through the ring at room temperature.

-Heat the ball using a Bunsen burner for one minute.

-Try to pass the ball through the ring and observe what happens.

-Let it cool for some time and try passing the ball again.

(i) What was the purpose of experiment? (1 mark)

To demonstrate actual expansion of solids.

(ii) What happens when you try to pass the ball through the ring before heating it? (1 mark)

It easily slips through the ring

(iii) What happens to the ball when heated? (1 mark)

When the ball is heated it expands and increases in diameter.

(iv) What happens when you try to pass the ball just after heating it? Explain. (2 marks)

The ball does not pass through the ring since the diameter of the ball increases.

(v) What is observed when you try to pass the cooled ball through the ring? (1 mark)

**It easily pass through.**

b) Explain **three** areas in which (a) (i) above can be applied. (6 marks)

* in the construction of railway lines–an expansion joint is allowed between any two rails to

accommodate expansion

* in the construction of bridges and roof tops (steel girders)–for bridges one side has rollers

while the other is fixed to allow for expansion. Concrete slabs are also laid on the ground leaving space filled with pitch to allow for expansion.

* In hot water pipes–pipes carrying hot water (steam) from boilers are fitted with expansion joints for expansion.
* Riveting–used to join two pieces of metal together i.e. bimetallic strips, car bodies, drums etc. Fitting rail cart wheel using heat uses the principle of rivets.

1. (a) Define matter. (1 mark)

**Anything that occupies space and has mass.**

(b) Name two states of matter. (2 marks)

* **Solids**
* **Liquids**
* **Gases**

(c) Mention three examples of physical changes of matter. (3 marks)

* **Dissolving solids in liquids**
* **Change of state such as melting and evaporation.**
* **Charging electrically**
* **Thermal expansion due to heating**
* **Magnetizing**

(d) Name **three** sub-atomic particles that make up an atom. (3 marks)

* **Protons**
* **Neutrons**
* **Electrons**

(e) Give a reason for each of the following: (2 marks)

(i) Forces of attraction of individual atoms in solids are very strong.

**They have a small space between them.**

(ii) Solids have fixed shapes.

**Vibration in their fixed positions.**

1. A student blows into one end of a U-tube containing water until the levels differ by 40.0 cm. if the atmospheric pressure is 1.01 105N/m2 and the density of water is 1000 kg/m3, calculate his lung pressure. (3 marks)

Lung pressure = atmospheric Pressure + liquid pressure

P1 = P0+ hρg. Hence P1= (1.01 × 105) + (0.4 × 10 × 1000) = 1.05 × 105N/m2

(b) Explain three areas of application of pressure in gases and liquids. (6 marks)

* Rubber sucker–this is a shallow rubber cap. Before use it is moistened to get a good seal then pressed firmly on a smooth surface so that the air inside is pushed out. The atmospheric pressure will then hold it firmly against the surface . They are used by printing machines to lift papers, lifting glass panes, heavy metal sheets
* Drinking straw–when a liquid is drawn using a straw air is sucked through the straw to the lungs. This

leaves the space in the straw partially evacuated. The atmospheric pressure pushing down the liquid in the container becomes greater than the pressure inside the straw and this forces the liquid into your mouth.

* The syringe–hey work in the principle as the straw. They are used by the doctors in hospitals for giving injections
* Bicycle pump–it uses two valves, one in the pump (greasy leather) and the other in the tire. When the handle is pushed in, the pressure inside the barrel becomes greater than the one in the tire and this pushes air inside. The valve in the tire is made such that air is locked inside once pumped.