**P510/1**

**PHYSICS**

**Paper 1**

(THEORY)

**November 2024**

**2 Hours**

**UGANDA ADVANCED CERTIFICATE OF EDUCATION**

**END OF TERM III EXAMINATIONS 2024**

S.5 PHYSICS

**Paper 1**

**2 Hours 30 Minutes**

**INSTRUCTIONS**

* This paper consists of **two** sections; **A** and **B**. Attempt any **five (5)** questions.
* Where necessary take;

Acceleration due to gravity, g =

Specific heat capacity of water =

Density of water =

**SECTION A**

1. (a) Define the following;
2. Vector and scalar quantities. (2marks)
3. The newton. (1mark)

(b) Use the method of dimensions to show that and are equivalent. (2marks)

(c) Figure below shows forces 3.0N, 4.5N and 5.0N acting on a body P of mass 500g. If P was initially at rest, calculate the distance P moves in 5 seconds. (6marks)

Y-axis

3.0N

4.5N

300

300

X-axis

3.5N

200

5.0N

(d) (i) Explain why the tension in a cable of a lift when it is ascending is different from when it is descending. (3marks)

(ii) Explain the circumstances under which a person in a lift may feel weightless. (2marks)

(e) A stone is projected horizontally with a velocity of from a height of 60m above the ground. Find how far the stone travelled horizontally. (4marks)

2. (a) Define the following;

(i) Acceleration (1mark)

(ii) Instantaneous velocity. (1mark)

(b) A child wishing to reach the top of a vertical pole, climbs 3m in 1 second and slides down 2m in the next second. The child climbs another 3m in 1 second and slips by 2m in the next second. The process is repeated until the top is reached in a total of 9 seconds.

(i) Using a graph paper, draw a displacement time graph for the motion of the child. (4marks)

(ii) Find the height of the pole. (2marks)

(c) (i) State the laws of friction between two solid surfaces in contact. (3marks)

(ii) Explain the origin of friction between two solid surfaces in contact. (3marks)

1. Balls A and B of respective masses 5kg and 3kg, move in a straight line in the same direction on a horizontal surface when A knocks B which is moving at , it stops but B continues to move in the same direction and comes to rest in a distance of 81.5m. Calculate the velocity of A before collision, assuming the coefficient of friction between the balls and the surface is 0.25. (6marks)

3. (a) (i) Explain the terms free fall and uniform deceleration. (2marks)

(ii) Derive the expression relating the distance, s, the initial velocity, u, the time of acceleration, t and the acceleration, a, for a body moving in a straight line with uniform acceleration. (2marks)

(iii) Show that the equation in (a) (ii) above is dimensionally correct. (2marks)

(b) An old car of mass and tractive pull climbs a track which is inclined at an angle of to the horizontal. The velocity of the car at the bottom of the incline is and the coefficient of sliding friction is 0.2s.

Calculate;

1. The distance travelled along the incline before the car comes to a halt. (4marks)
2. The time taken travelling along the incline before the car comes to a halt. (2marks)

(c) A ball is projected upwards at an angle of 300 to the horizontal. If the initial velocity of the ball is , calculate the maximum height and the range of the ball reached. (4marks)

(d) Explain why more energy is required to push a wheel barrow uphill than on a level ground.

4. (a) Distinguish between perfectly elastic and perfectly inelastic collisions and give one example for each. (2marks)

(b) Two balls A and B of masses and initially approaching each other with velocities and respectively had a head on collision. If A continued in its original direction with a velocity, while B reversed its direction with a velocity, . Show that + = -, if the collision is perfectly elastic. (4marks)

(c) Explain why a martial arts player breaks a pile of bricks with ease. (3marks)

(d) Prove that for a body projected vertically upwards, mechanical energy is conserved. (5marks)

(e)

24.5N

90N

40N

600

Three forces of 90N, 40N and 24.5N act on a block placed on a smooth surface inclined at an angle of to the horizontal.

Calculate;

1. The acceleration of the block. (3marks)
2. The gain in kinetic energy after moving 5 seconds from rest. (3marks)

**SECTION B**

5. (a) (i) Define the term thermometric property. (1mark)

(ii) Using a well labeled diagram, describe how unknown temperature on Celsius scale can be determined using a platinum resistance. (5marks)

1. A certain platinum resistance thermometer has a resistance of 2.4Ω at ice point, 3.34Ω at steam point. Find the value of the resistance of platinum coil of thermometer at -50C. (3marks)
2. The length of the liquid column is 2.0cm at the ice point, 2.7cm at steam point and 8.4cm at unknown temperature. Calculate the unknown temperature in Kelvin. (3marks)

(b) The resistance of a solid at a temperature of 0C measured on a standard scale is given by R = R0 (1 + + ), where and are constants. Given that = 0.001, calculate the temperature on the resistance thermometer scale if on the standard scale the temperature is

(c) An electric heater of 2KW is used to heat 500g of water initially at in a kettle of heat capacity. How long will it take to heat the water to its boiling point. (3marks)

6. (a) Define specific heat capacity and state its units. (2marks)

(b) (i) With use of a well labeled diagram, describe the continuous flow method to determine the specific heat capacity of a liquid. (6marks)

(ii) State any two advantages of the continuous flow method over the method of mixtures. (2marks)

(c) Cold water at C and hot water at C are run into a tank at a rate

of per minute and per minute respectively. At the point of filling the tank, the temperature of the mixture was C. Calculate the time taken to fill the tank if its capacity is . (5marks)

(d) Explain why the coolant used in car should have high specific heat capacity. (2marks)

(e) 3.21g of a liquid at C is mixed with 100g of water at C which is already in the calorimeter of specific heat capacity. Find the new temperature of water assuming heat loses are negligible. (Specific heat capacity of liquid ) (3marks)

**END**