

S.3 PHYSICS SUPPLEMENTARY EXAMINATIONS

JANUARY 2016

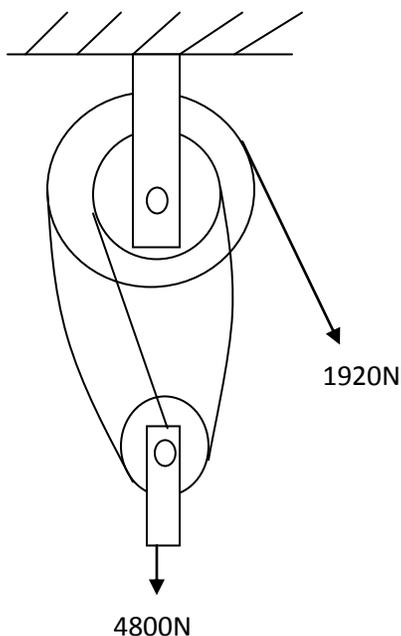
Assume where necessary ;

Acceleration due to gravity, $g = 10\text{ms}^{-2}$

Attempt any *four* Questions

All questions carry equal marks.

1. (a) Define the following terms in relation to machines;
- (i) mechanical advantage. (1)
 - (ii) velocity ratio. (1)
 - (iii) efficiency. (1)
- (b) The figure below shows a block and tackle pulley system used for raising heavy loads.



- (i) State the velocity ratio of the system above. (1)
 - (ii) Calculate the mechanical advantage of the system above. (2)
 - (iii) Find the efficiency of the system and state any two reasons why the efficiency of the system is less than 100%. (4)
- c) State Archimedes principle. (1)

d) A piece of a metal weighs 28.4N in air and 25.2N when completely immersed in a water. Find the

(i) upthrust in water. $(1\frac{1}{2})$

(ii) density of the metal given that the density of water is 1000kgm^{-3} . $(3\frac{1}{2})$

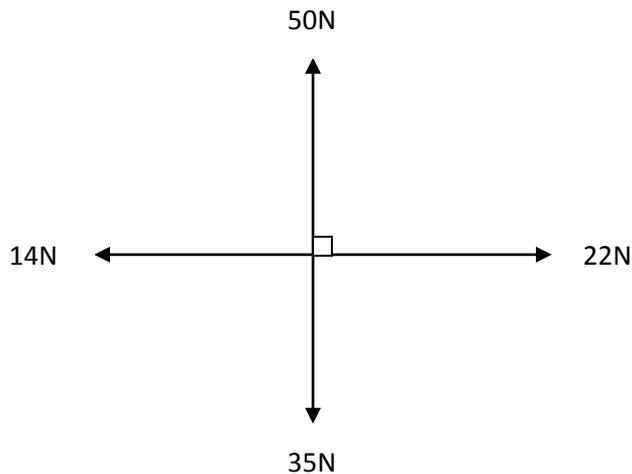
2. (a) (i) Distinguish between scalar and vector quantities. (1)

(ii) Classify ; pressure, weight, charge, velocity, displacement and mass as either scalar or vector quantities. (3)

b) (i) Define velocity and uniform acceleration (2)

(ii) Draw a sketch velocity - time graph for a body moving with uniform acceleration. (1)

b) The figure below shows four forces of magnitudes 14N, 22N, 35N and 50N acting on a particle of mass 8.5kg initially at rest.



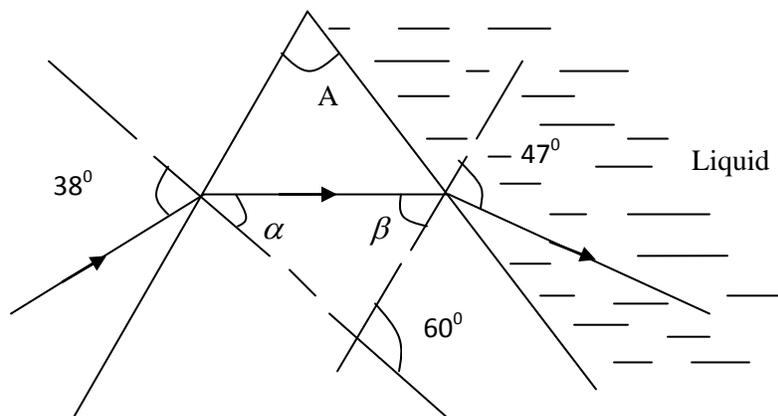
Find the

(i) magnitude of the resultant force on the particle. (4)

ii) acceleration and distance covered by the particle in 10s. (5)

3. (a) Define specific heat capacity . (1)

- (b) Calculate the quantity of heat required to raise the temperature of 100kg of water from $15^{\circ}C$ to $35^{\circ}C$ given that the specific heat capacity of water is and state its S.I unit. (3)
- c) (i) State three differences between boiling and evaporation. (3)
- (ii) Explain why evaporation causes cooling. (3)
- d) (i) Describe a simple experiment that shows that metals expand when they are heated. (4)
- (ii) State the principle on which functioning of a bimetallic strip is based and name one application of a bimetallic strip. (2)
4. a) (i) State the laws of reflection. (2)
- (ii) Calculate the number of images formed when two plane mirrors are inclined to each other at an angle of 36° . (2)
- b) An object of height 4cm high is placed from a diverging lens of focal length 20cm . Using the graphical method determine the position and size of the image formed. (5)
- c) Define refractive index of a medium. (1)
- d) The figure below shows a ray monochromatic light travelling from air and incident to one refracting face of a glass prism of refractive index 1.5 at an angle of 38° whose other refracting face is covered by a liquid.



Given that the ray emerges from the prism at an angle of emergence of 47° into the liquid, find;

- i) the angles marked A , α and β (4)

- ii) the refractive index of the liquid. (2)
5. (a) (i) Define pressure and state its S.I unit. (2)
- (ii) State any two factors that affect pressure in liquids. (2)
- (b) An open tank is filled with a liquid which has a density of 1200kgm^{-3} to a depth of 15m. Given that atmospheric pressure is $1.01 \times 10^5\text{pa}$, calculate the pressure at the bottom of the tank. (4)
- (c) (i) State the principle of transmission of pressure. (1)
- (ii) State any three applications of principle of transmission of pressure. (3)
- (iii) In a hydraulic machine, the pistons in two connected cylinders have cross-sectional areas of 4cm^2 and 480cm^2 . Calculate the effort needed to be exerted on the small piston to raise a load of 8400N on the larger piston. (4)

END