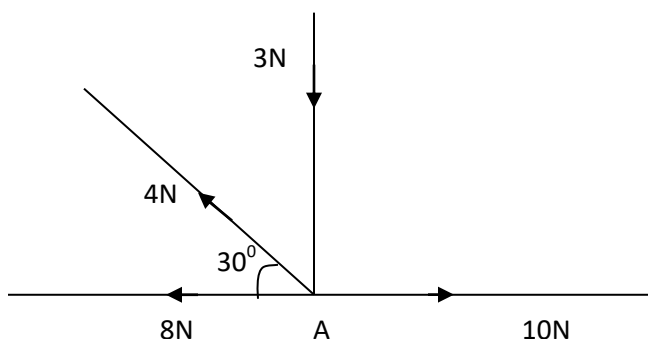


S.6 PHYSICS PAPER ONE REVISION QUESTIONS (5th May 2020)

1. a) i) State Newton's second law of motion. (01)
- ii) A stream of water travelling horizontally at 30ms^{-1} is ejected from a hole of cross sectional area 40cm^2 and is directed against a vertical wall. Calculate the force exerted on the wall assuming that the water does not rebound. Calculate the power of the pump necessary to give the ejected water the necessary kinetic energy. (05)
- b). A block of mass m resting on a smooth horizontal surface is attached to one end of a horizontal light spring whose other end is fixed. The block is pulled through a distance a and then released . The displacement of the block from the equilibrium position at any time t is given by $x = A \sin \omega t$ where ω is the angular frequency.
- i) Sketch a graph to show the variation of velocity of the block with displacement. (01)
- ii) Show that the total mechanical energy of the spring –mass system is conserved. (05)
- c). i) A wooden block of mass 3.98Kg rests on a smooth horizontal surface. The block is attached to a light spring of force constant 100Nm^{-1} , whose other end is fixed. A bullet of mass 0.02kg fired into the block embeds itself in the block and the spring is compressed by 0.40m . Find the velocity of the bullet just before it hits the block. (04)
- ii) Suppose the horizontal surface in c(i) were rough and the coefficient of kinetic friction between the block and surface were 0.3 , through what distance would the composite mass have moved before coming to rest momentarily? (04)
2. a) Distinguish between scalar and vector quantities, giving two examples of each. (01)
- b) Figure below shows forces of 8N , 3N , 4N and 10N acting on a particle of mass 5kg at a point A as shown.

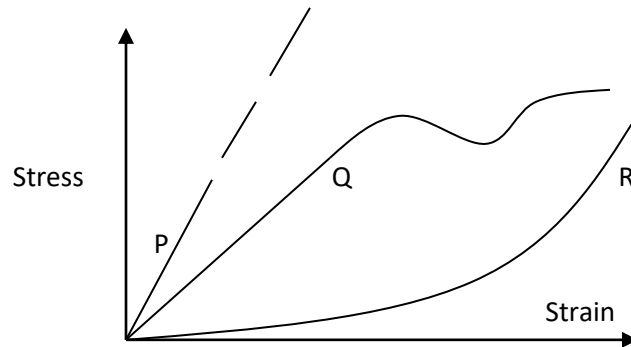


Find the acceleration of the particle and the distance it covers in 2s assuming it was initially at rest. (06)

- c) A uniform beam AB of mass 10kg and length 2m has its lower end A freely hinged at a fixed point and a particle of mass 4kg attached to B. A horizontal string is attached to point X on the rod where AX is 1.5m. If the system rests in equilibrium, with the beam making an angle of 45° with the vertical, find the tension in the string. (06)
- d) A car X moving at a constant speed of 108kmh^{-1} overtakes another car Y moving at 9kmh^{-1} but accelerating at 5ms^{-2} .
- How long will it take for car Y to catch up with car X?
 - At what speed will car Y be moving when it overtakes X?

3. a) Define the terms elastic limit and Young's modulus. (02)

- b) The figure below shows the stress-strain curves for a metal wire, rubber and glass.



- Identify each of the curves. (03)
 - Explain the characteristic features of R. (02)
- c) Two metal wires, one of steel and the other of bronze each of length 1.5m and diameter 0.20cm are joined end to end to form a composite wire of length 3.0m. When subjected to a stretching force, the composite wire stretches by $6.4 \times 10^{-4}\text{m}$. Calculate the tension in the composite wire. [Young's moduli for steel and bronze are $2 \times 10^{11}\text{Nm}^{-2}$ and $1.2 \times 10^{11}\text{Nm}^{-2}$ respectively.] (06)
- d) State Archimedes principle. (01)
- e) A solid weighs 237.5g in air and 12.5g when totally immersed in a fluid of density 0.9gcm^{-3} , calculate the density of the liquid in which the solid would float with one fifth of its volume exposed above the liquid surface. (06)