[3220/469] 1992

SCOTTISH CERTIFICATE OF EDUCATION

PHYSICS (REVISED)

Higher Grade—PAPER II

Thursday, 14th May—1.30 p.m. to 4.00 p.m.

READ CAREFULLY

1. **All questions should be attempted.**

2. **Enter the question number clearly in the margin beside each question.**

3. **Use the approximation $g = 10\,\mathrm{m\,s^{-2}}$ or $g = 10\,\mathrm{N\,kg^{-1}}$.**

   Any other data required will be found in the Science Data Booklet (1982 edition) provided.

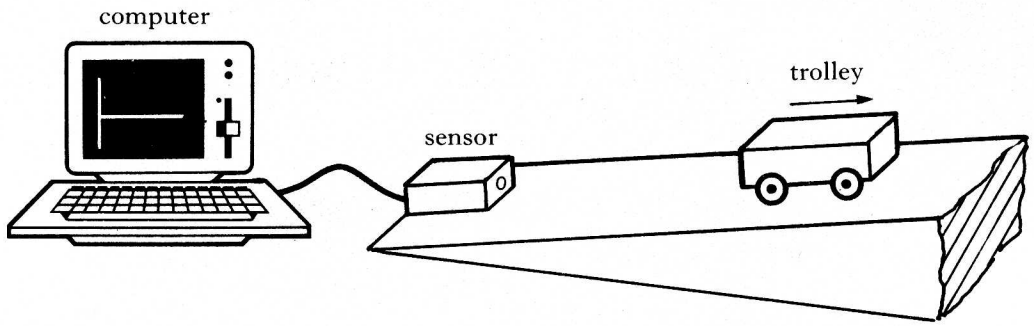
4. **Care should be taken not to give an unreasonable number of significant figures in the final answers to calculations.**

5. **Square-ruled paper (if used) should be placed inside the front cover of the answer book for return to the Examination Board.**

UCP 3220/469 6/3/16560

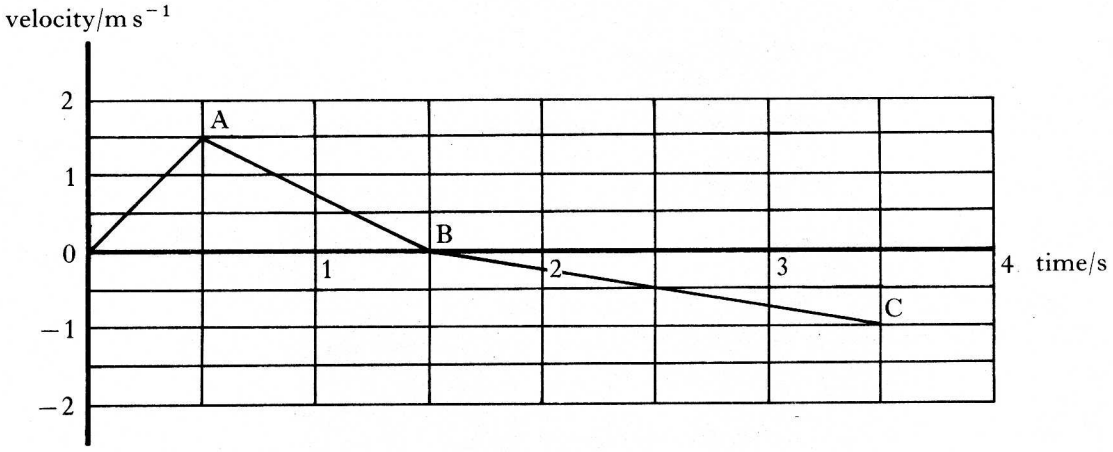
Marks

1. The velocity of a trolley on a slope can be investigated using a computer and a sensor as shown below.



The sensor emits ultrasound pulses which are reflected from the trolley. The computer measures the time between emitted and reflected pulses and uses this information to calculate the velocity at regular times.

In an investigation, the trolley is given a sharp push **up** the slope and then released. The graph below shows the resulting velocity-time graph as displayed on the screen.



Point A on the graph corresponds to the instant at which the trolley is released.

(*a*) At what time is the trolley at its maximum displacement from the sensor? You must justify your answer. **2**

(*b*) On the square-ruled paper provided, draw the corresponding acceleration-time graph of the motion. **3**

(*c*) Draw a diagram to show the forces acting on the trolley as it moves **up** the slope after the push is removed. Show only forces or components of forces acting parallel to the slope. **1**

(*d*) Explain, in terms of the forces acting on the trolley, why the magnitude of the acceleration from A to B differs from the magnitude of the acceleration from B to C. **2**

(8)