

Sample Physics Entrance Examinations

The main entrance exam for physics at Asian University covers:

- (i) Basic heat (i.e. temperature, modes of heat transfer, specific heat capacities, latent heats, phase changes, ideal gases, etc.);
- (ii) Basic electricity (i.e. Ohm's law, simple circuits, emf, energy losses, etc.); and,
- (iii) Basic mechanics (i.e. Newton's laws, equations of motion for constant acceleration, energy, forces, work, etc.).

There are three (3) questions each requiring about ten minutes' of work (i.e. thirty minutes in total). The physics examination is combined with the mathematics examination (also requiring about thirty minutes), and so the combined physics-mathematics examination lasts one hour (weighted equally between mathematics and physics).

An example of a question is given below.

(1) 30 kg of water at 75°C is mixed with 10 kg of ice at -5°C . Determine the final temperature of the mixture. (The specific heat capacities of water and ice are $4180\text{ J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ and $2089\text{ J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ respectively; and the latent heat of fusion of water is $333\text{ kJ}\cdot\text{kg}^{-1}$).

The scholarship examination covers basically the same topics as the main entrance exam, but with more challenging problems together with the inclusion of some “modern” physics problems (e.g. atomic physics, basic special relativity) to test those who have done additional reading around the subject. *It should be emphasized, however, that it is still possible to pass the scholarship examination without answering any questions on modern physics, relying instead on the classical physics topics of heat, electricity and mechanics outlined earlier.* The scholarship examination for physics alone lasts one hour; with the candidate selecting any four (4) questions selected from six (6); each question therefore carries 25% of the total.

An example of a scholarship examination question is given below:

(1) A small object of mass 2.5 kg is attached to one end of a rope of length 1.2 m. The rope has negligible mass. The small object and the rope are whirled in a *vertical* circle as shown below in Figure 1.1. The small object is observed to have a speed of 6 m/s at position A.

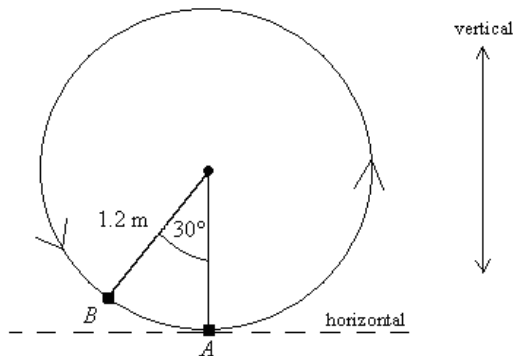


Figure 1.1

- (a) Calculate the radial and tangential accelerations of the small object at position B, and use these values to calculate the *magnitude* of the total acceleration of the small object at position B .
- (b) Calculate the tension in the rope at position B.

The examinations are marked positively, meaning that candidates are given marks for using the correct methods and principles, and are not overly punished for numerical errors. The purpose of the examinations is to assess how much understanding and knowledge the candidate has of basic physics.