



FHSST Authors

**The Free High School Science Texts:  
Textbooks for High School Students  
Studying the Sciences  
Physics  
Grades 10 - 12**

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this a continuously evolving resource!

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**Part V**

**Exercises**



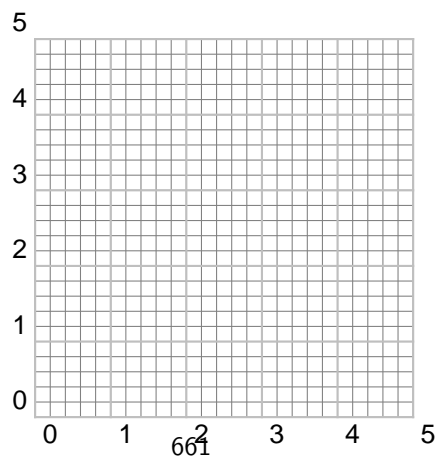
# Chapter 32

## Exercises

The exercises included in this chapter span over multiple chapters or are no longer required by the syllabus.

- [SC 2002/11 SG] Which one of the following combinations contains one SCALAR and one VECTOR quantity?
  - momentum and force
  - displacement and acceleration
  - potential difference and electric field strength
  - resistance and electric current
- [DOE 2005/11 SG1] Which one of the following pairs consists of two vector quantities?
  - time, acceleration
  - velocity, displacement
  - electric field strength, charge
  - momentum, kinetic energy.
- [IEB 2004/11 HG1] Which one of the following is not equivalent to the SI unit of energy?
  - N.s
  - N.m
  - V.C
  - W.s
- [IEB 2002/11 HG1 - Electrostatics] **Millikan's Oil Drop Experiment**

The diagram below represents the apparatus used to measure the charge carried by oil droplets. The droplets are sprayed above the top plate and eventually a single droplet finds its way through a small hole into the space between the plates.



The mass of the droplet is  $m$  and it carries a negative charge of magnitude  $q$ . The distance between the plates is  $d$ . The oil droplet between the two plates is stationary.

A Use expressions for the electric field intensity and weight to derive a formula for the charge carried by the oil droplet.

B In one particular experiment, a student reported that, while using a voltage of 400 V between the plates, she had obtained a value of  $4,8 \times 10^{-19}$  C for the charge on the oil droplet. Another student said that he had repeated the same experiment with the same oil droplet but that he had used 800 V to keep the oil droplet stationary. If this were true, what would be the charge on the oil droplet, and why would you doubt what he had reported?

5. [IEB 2004/11 HG1] An electric motor lifts a load of mass  $m$  through a vertical height  $h$  at a steady speed of  $v$ . It is connected to a power supply of potential difference  $V$ , and it draws a current  $I$ . Assume that 90% of the energy input is transferred to useful work done, and that the load comes to rest at the top of this height  $h$ .

Which expression correctly relates the power input to the power output for this system?

A  $VI = (0,9)mgh$

B  $VI = (0,9)mgv$

C  $(0,9)VI = mgh$

D  $(0,9)VI = mgv$

# Appendix A

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