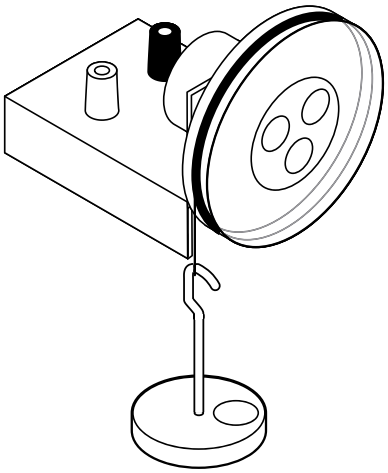
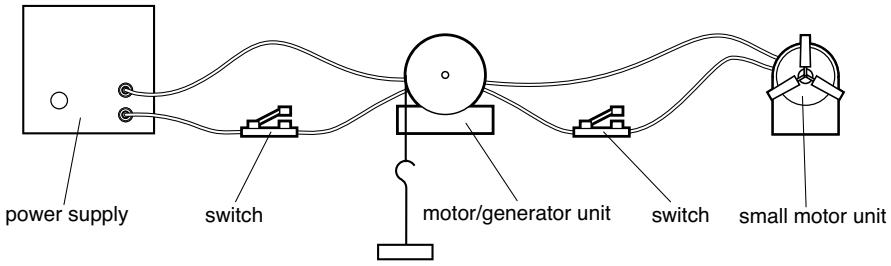
ENERGY STORAGE:
LIFTING A LOAD

Energy can be stored by lifting a load away from the Earth. In this activity, you will be using a motor/generator unit first to raise a mass and then releasing the mass in order to create an electrical current. This is an example of a *gravitational store* of energy.



Task A
Raising a mass to store energy

1. Connect the apparatus as shown in the diagram below. The cord should be attached at one end to a 100 g mass resting on the ground and at the other end to the *larger* pulley on the motor/generator unit. Set the power supply to 0 V d.c.



2. First, raise the mass by pressing the left-hand switch to connect the power supply to the motor/generator unit. *Gradually* increase the voltage until the mass starts to rise slowly.

3. When it has reached its maximum height, then *at the same time* release the left-hand switch and press the right-hand switch.

4. What happens to the small motor?

5. How can you explain what happens in terms of energy?

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Task B
Measuring efficiency: storing the energy

Note: the energy stored when a 100 g mass is raised by a distance of 1 metre is approximately 1 joule (J).

6. The apparatus from Task A should be arranged so that the mass is raised by a distance of 1 metre.

7. Connect an energymeter between the power pack and the motor/generator unit. Set the knob of the energymeter to measure 'energy'.

8. Press the 'start/stop' button on the energymeter to start recording energy, and press the left-hand switch to raise the mass. When it has reached its maximum height, press the 'start/stop' button on the energymeter again to stop recording.

9. Make a note of the energy reading. What is the efficiency of this energy transfer?

10. Repeat the experiment to see if you get consistent readings.

11. Try using masses of 200 g and 300 g – do you get the same efficiency with different loads?

Task C
Measuring efficiency: releasing the energy

12. To measure the efficiency of the energy transfer when the mass falls, connect the energymeter between the motor/generator unit and the small motor. (To get the current in the right direction, swap the red and black leads going into the energymeter.)

13. After lifting a 100 g mass, hold on to the pulley so that the mass does not fall. Now press the 'start' button on the energymeter to start recording energy and let go of the pulley.

14. How much energy was transferred to the motor? What is the efficiency of this energy transfer?

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