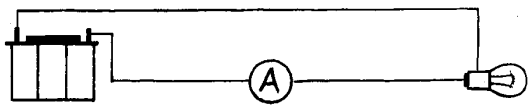
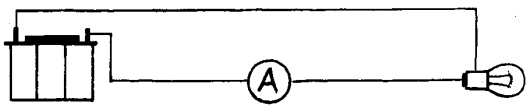
1. Calculate the missing values.

a)



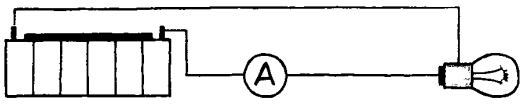

$U$ = 6.0 V $I$ = 6.0 A $P$ = ?

b)



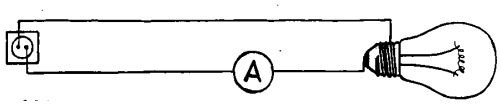

$U$ = 6.0 V $I$ = ? $P$ = 18 W

c)




$U$ = ? $I$ = 3.0 A $P$ = 36 W

d)




$U$ = 220 V $I$ = ? $P$ = 100 W

2. The energy consumption information on an electric device reads 75 W/220 V. This means that it consumes 75 W if connected at 220 V (operating voltage).
a) Calculate the electric current.
b) What is the resistance of the light bulb?

3. Find a formula for calculating the electric power from
a) resistance and voltage
b) resistance and current

*Hint:* use $P = U \cdot I$ and $R = \frac{U}{I}$

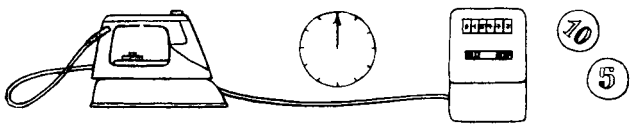
4. An electric device consumes 1.00 kW when connected to an 220 V power outlet (assume resistance is a constant).
a) What is the electric current?
b) Calculate the resistance.
c) What would the electric current be at 110 V?
d) What would the electric power be at 110 V?
e) What would the electric current be at 440 V?
f) What would the electric power be at 440 V?

5. Calculate the missing quantities. Please write down the formula, solved for the wanted quantity.

| | voltage | current | resistance | work | time | power |
|---|---|---|---|---|---|---|
| a) | | 2.00 A | 12.0 Ω | | 2.00 min | |
| b) | 150 V | 6.00 A | | | 80.0 s | |
| c) | 220 V | | | 13.0 kJ | 1.50 h | |
| d) | | 10.0 A | 600 Ω | 5.00 kJ | | |
| e) | 4.00 V | | | 120 J | | 20.0 W |
| f) | | 20.0 mA | | | 1.00 Tag | 90.0 mW |

6. Calculate the missing quantities (work in J *and* in kWh).

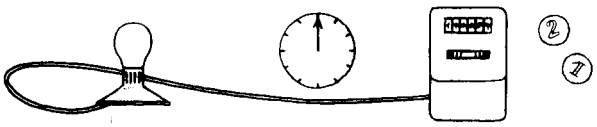
a)



$P$ = 1500 W $t$ = 2.0 h $W$ =?

What is the cost?
(1 kWh costs 20 Rp.)

b)



$P$ = 50 W $t$ = 10 h $W$ = ?

What is the cost?
(1 kWh costs 20 Rp.)

7. The nuclear power plant in Gösgen has a power output of 1'020 MW. (M = Mega = 1‘000‘000)
a) Calculate the output of electric energy per day (in J and in kWh)?
b) Calculate the price of the daily electric energy output (1 kWh costs 20 Rp.).

8. An electric current of 0.20 A flows through the filament of a small light bulb which is connected to 4.5 V battery. After 8.00 h the battery is “empty”; it cost 2.00 Swiss francs.
a) Calculate the amount of charged that passed through the light bulb.
b) What is the power consumption?
c) How much energy was consumed?
d) Calculate the cost of 1 kWh from the battery.
e) What would have been the cost of energy if it had been provieded by power outlet?

9. Calculate the resistance of a light bulb at operating temperature labeled as
a) 100 W/220 V
b) 40 W/220V

10. The efficiency of an electric motor is 70.0 %.
a) What is the total energy input, if the useful energy output is 460.0 kJ?
b) What is the extracted power output, if the power supplied is 50.0 kW?

11. A crane’s electric motor ($\eta$ = 75 %) lifts up a load of 400.0 kg ($h$= 15.0 m).
a) What types of energy do occur here? (*Hint*: there are three types.)
b) Which form of energy is the total energy input and which form of energy is useful energy? Which form of energy is considered as «waste»?
c) Calculate the amount of work required for lifting the load.
d) What is the amount of useful energy?
e) What amount of energy input into the motor is required for lifting the load?
f) What is the cost of lifting the load?

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solutions:

1. a) 36 W b) 3.0 A c) 12 V d) 0.45 A
2. a) 0.34 A b) 645 Ω
4. a) 4.55 A b) 48.4 Ω c) 2.27 A d) 250 W e) 9.09 A f) 4'000 W
5. a) 24.0 V, 5760 J, 48.0 W b) 25 Ω, 72.0 kJ, 900 W c) 10.9 mA, 20.1 kΩ, 2.41 W
   d) 6.00 kV, 0.0833 s, 60.0 kW e) 5.00 A, 0.800 Ω, 6.00 s f) 4.50 V, 225 Ω, 7.78 kJ
6. a) 10.8 MJ = 3.0 kWh, costs 60 Rp. b) 1.8 MJ = 0.50 kWh, costs 10 Rp.
7. a) $2.45 \cdot 10^7$ kWh = $8.81 \cdot 10^{13}$ J b) 4'896'000 Fr.
8. a) 5'760 C b) 0.900 W c) 25.9 kJ = 7.20 Wh d) 277.80 Fr. e) 0.144 Rp.
9. a) 484 Ω b) 1'210 Ω
10. a) 657 kJ b) 35.0 kW
11. c) 58.9 kJ d) 58.9 kJ e) 78 kJ d) 0.43 Rp.