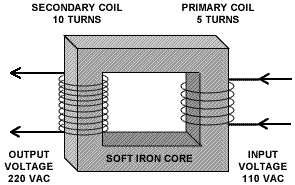
Transformer Design:

A transformer consists of two coils of wire wound round an iron core.

The input AC voltage is connected to the primary coil, while the output AC voltage is obtained from the secondary coil (see diagram).

Step-down transformers have MORE turns on the primary coil.



Step-up transformers have MORE turns on the secondary coil.

How transformers work:

The changing current in the primary coil creates a changing magnetic field in the iron core.

The changing magnetic field in the iron core induces a changing voltage in the secondary coil:

**Voltage across primary (Vp) = Number of turns on primary coil (Np)**

**Number of turns on secondary coil (Ns)**

**Voltage across secondary (Vs)**

An isolating transformer has THE SAME number of turns on the primary and secondary coil.

The mains supply is hidden in an isolating transformer. The output terminals are NOT live so there is no danger of you getting electrocuted if you touch them with wet hands. An ordinary circuit is not used because it would be live and could electrocute you if you touched it with a wet hand AND the water and steam in bathrooms could cause damage to the house’s wiring system.

Energy Loss:

When a current passes through a wire, the wire gets hot.

The transformer coils and overhead power lines of the national grid get hot and lose energy to the surroundings.

Reducing Transmission Loses:

Power is a measure of how fast energy is used up.

**Power Loss = (current2 x resistance)**

The electrical power supplied to the primary coil of a transformer is dependent on the input voltage and current:

**Pp = Vp x Ip**

Similarly, the output power of the secondary coil is given by:

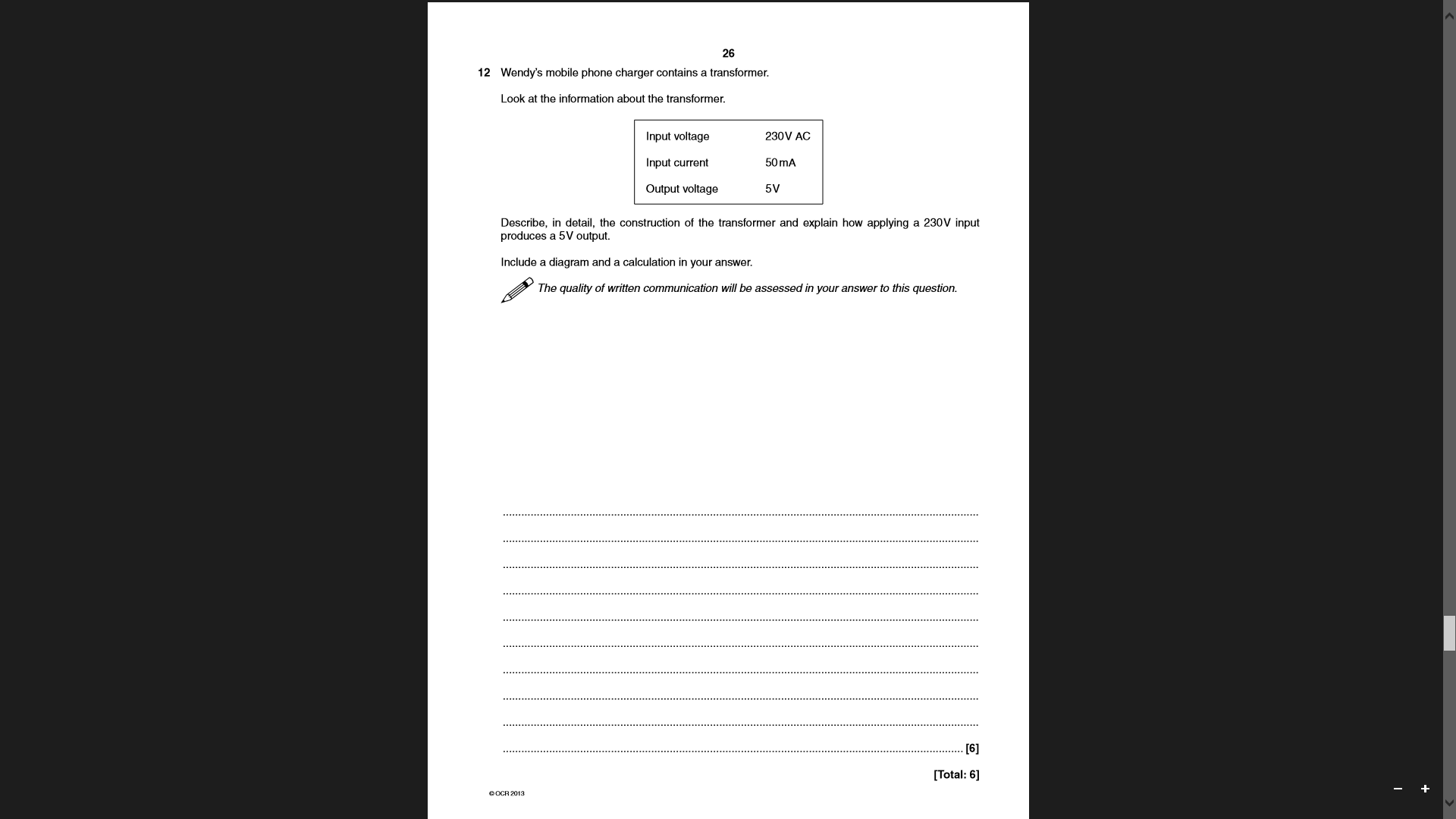
**Ps = Vs x Is**

If the transformer is 100% efficient, then the input voltage = the output voltage.

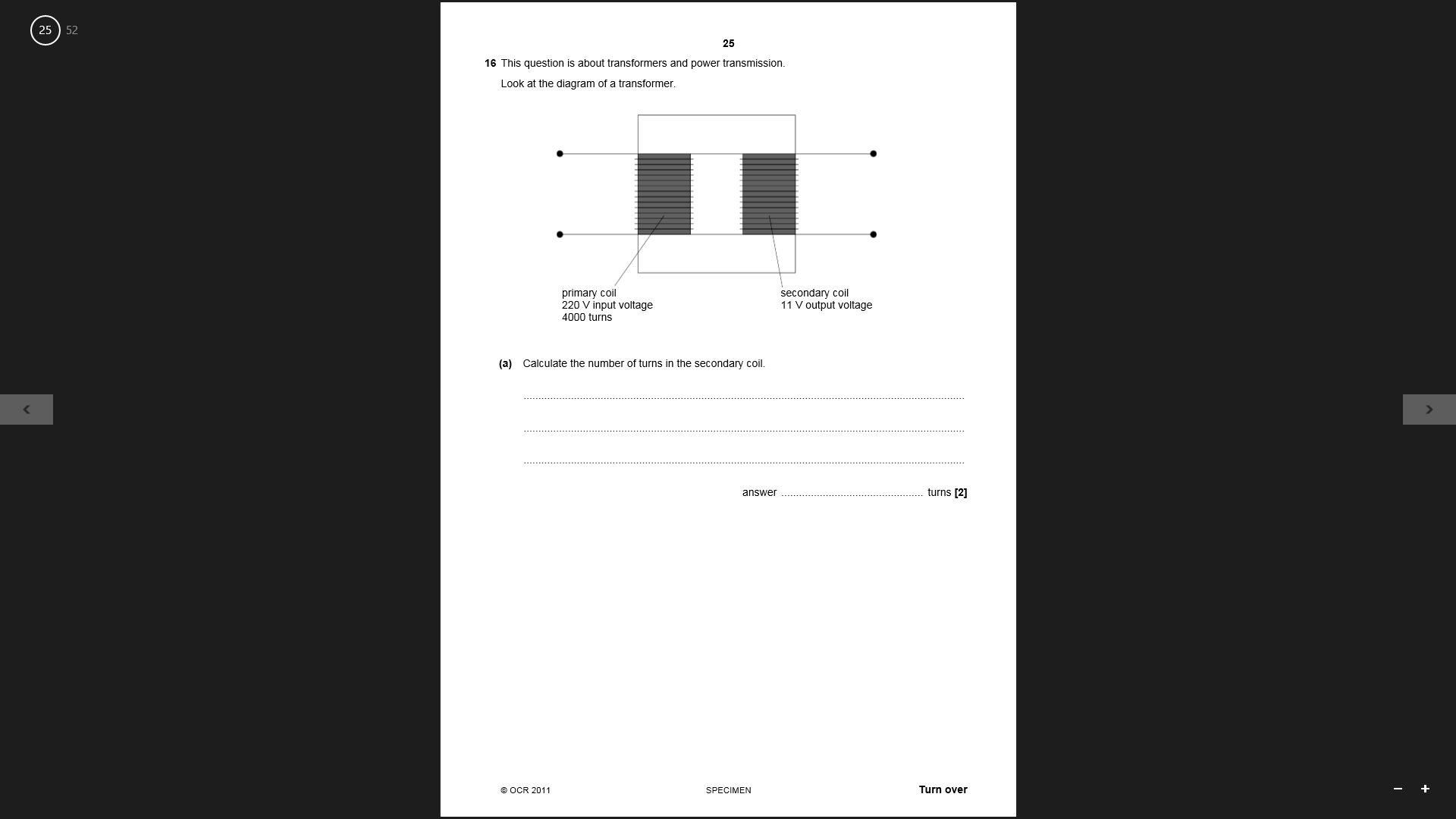
In a step-up transformer, increasing the voltage leads to a decrease in current by the same factor. This assumes that the transformer is 100% efficient; e.g.

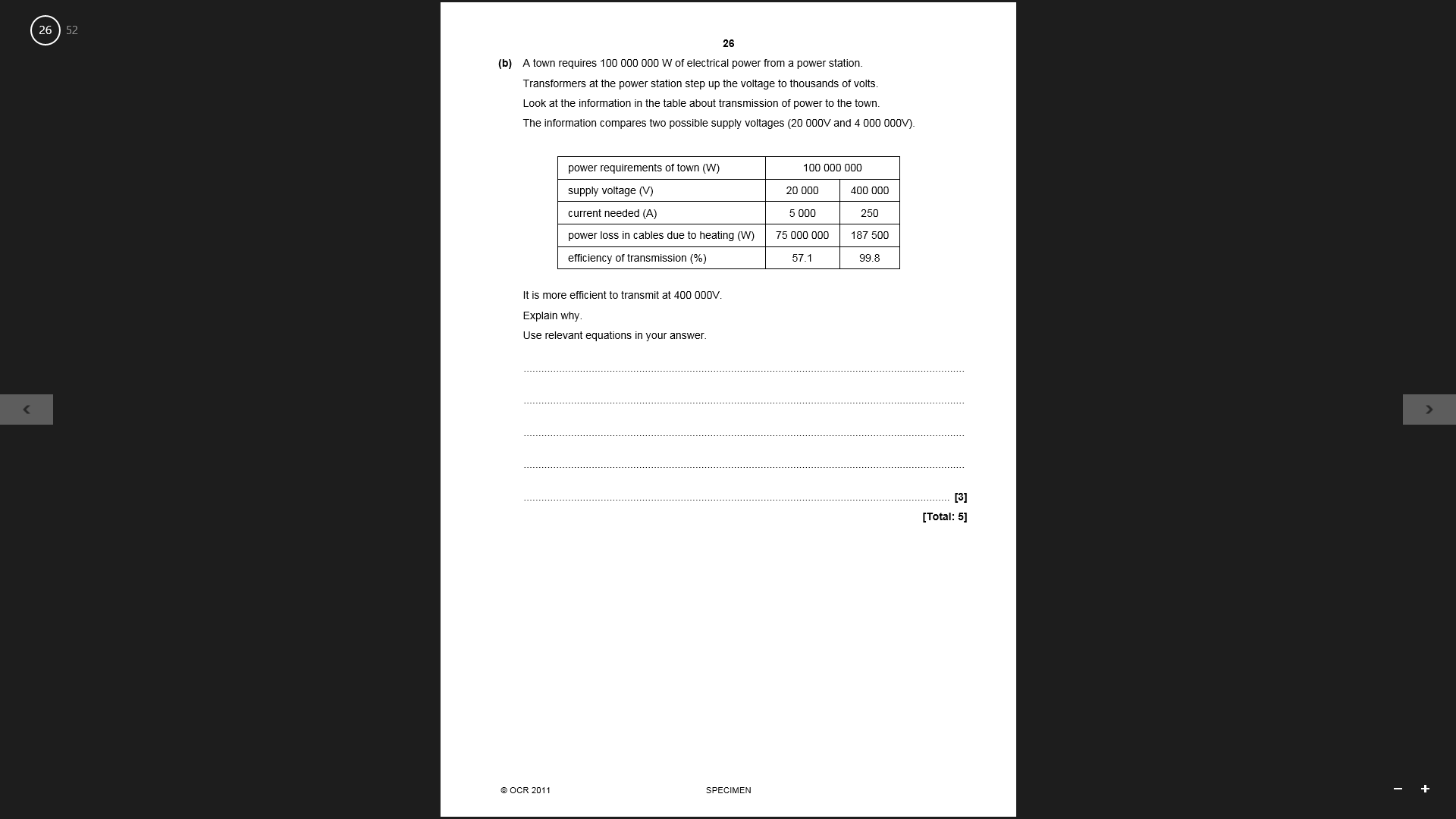
If the voltage was stepped up by a factor of 16 to 400kV, then the current in the overhead cables would reduce to 1/16 of what it would be if electricity was transmitted at 25,000V. (25,000 x 16 = 400,000V or 400kV).

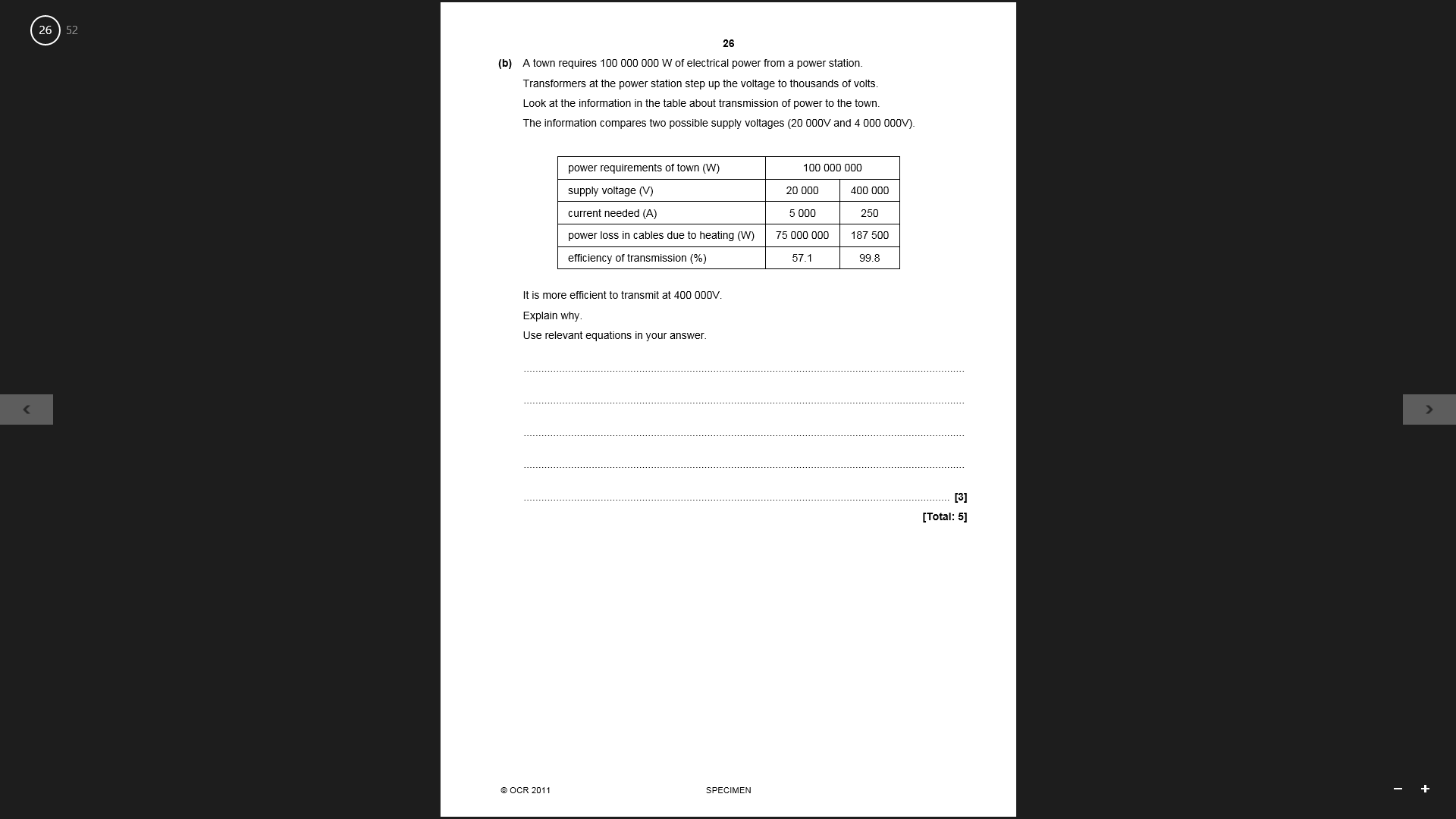
Past Papers:  
PPQ(1):



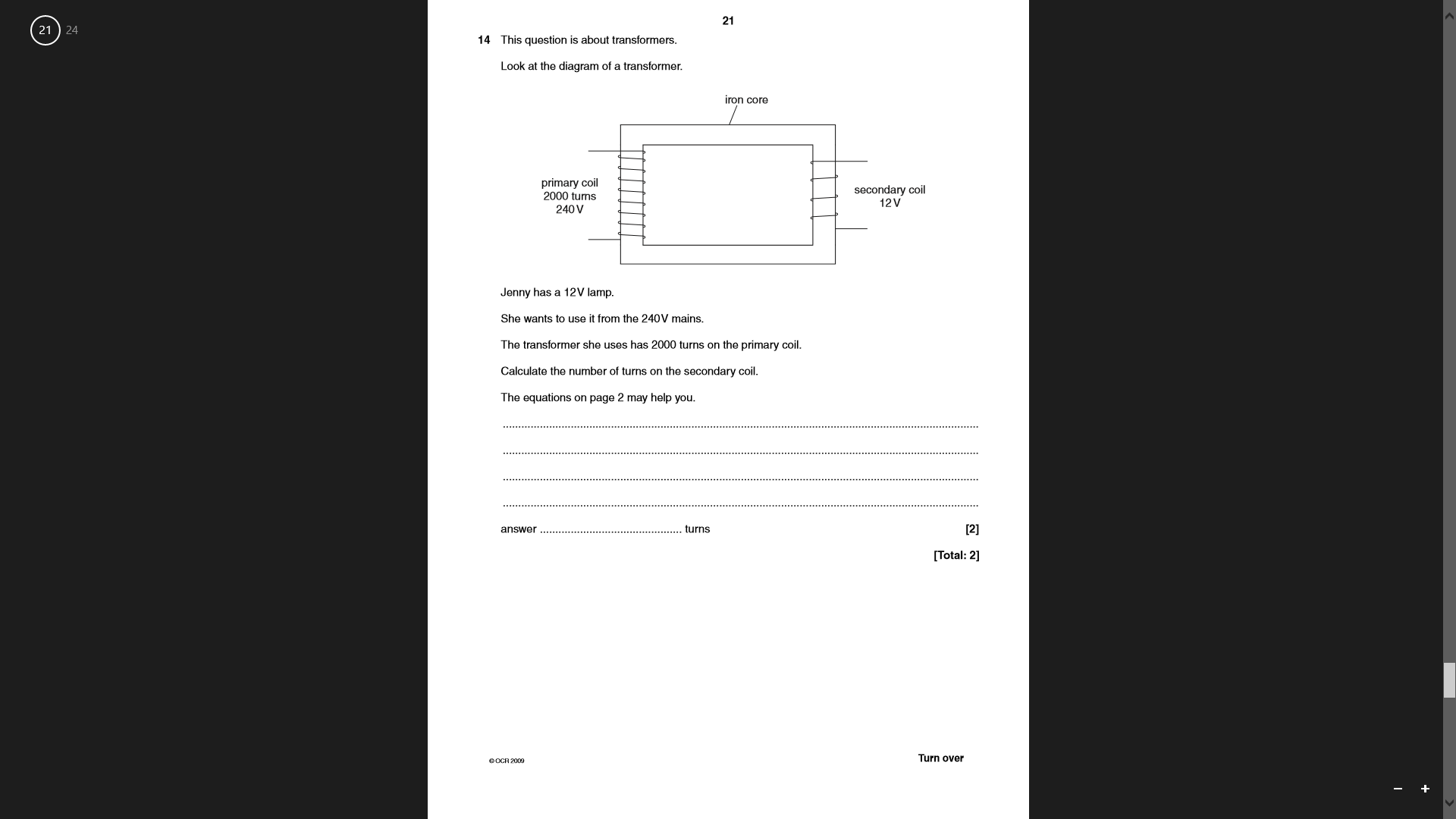
PPQ(2):



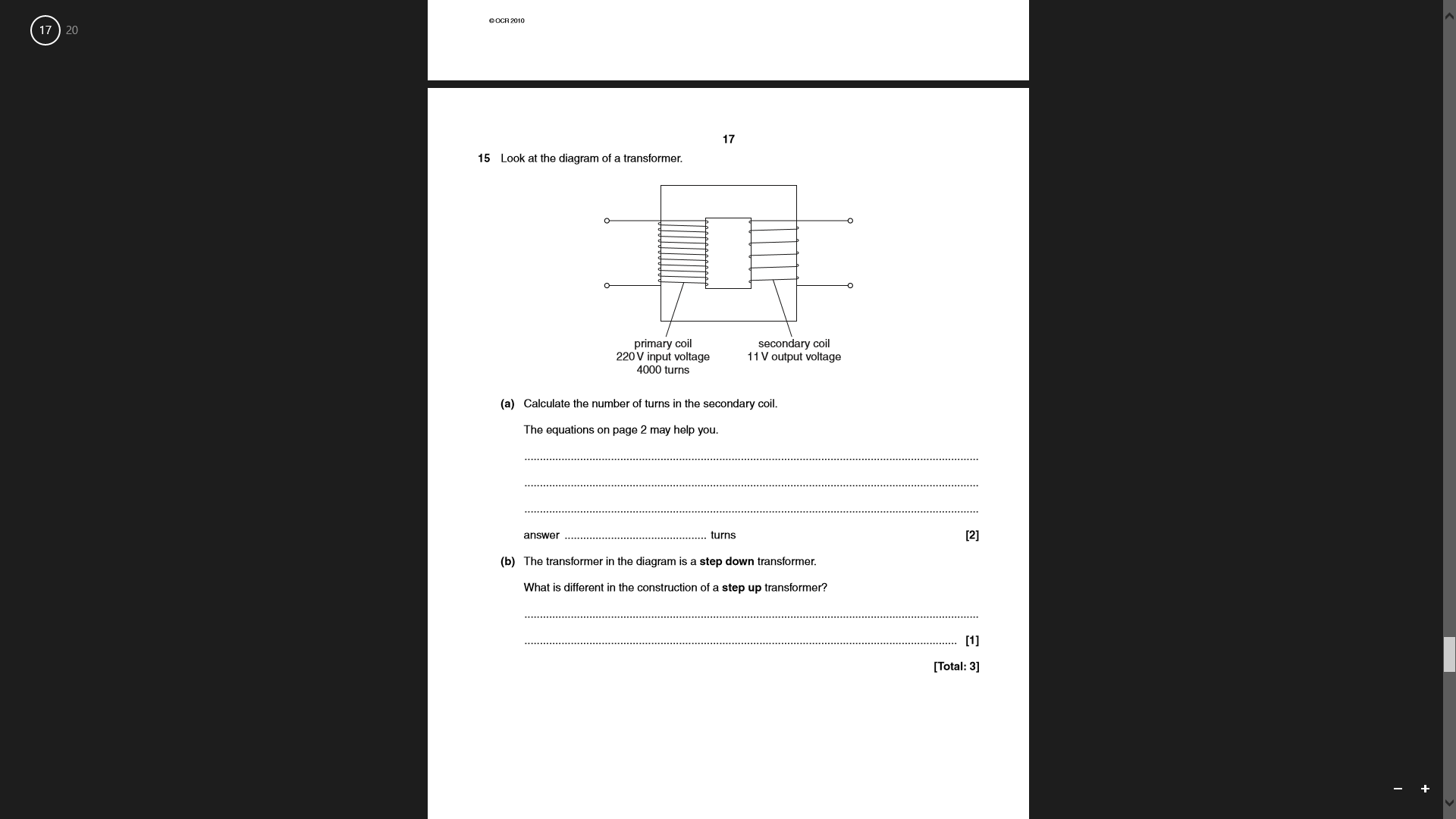




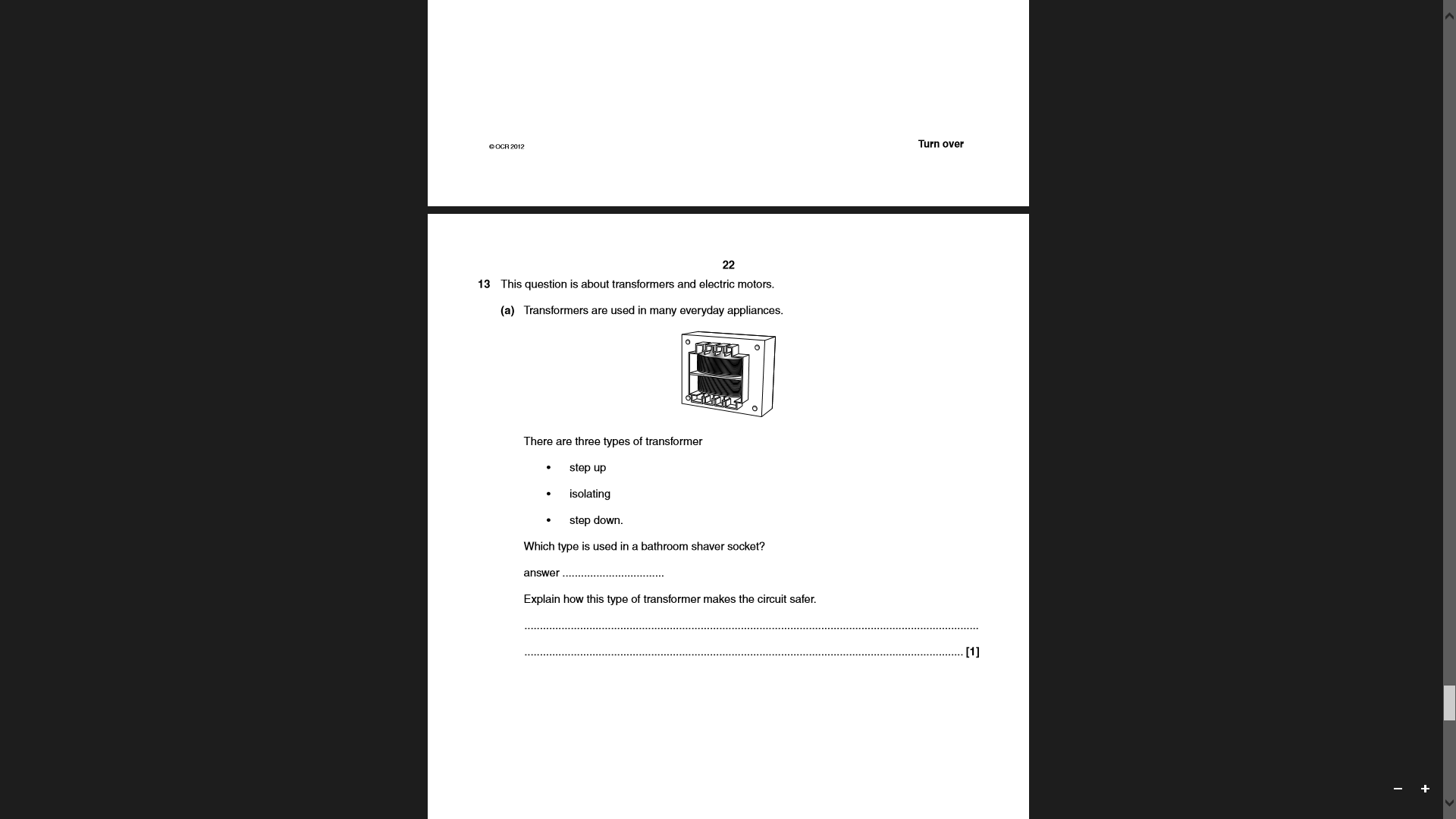
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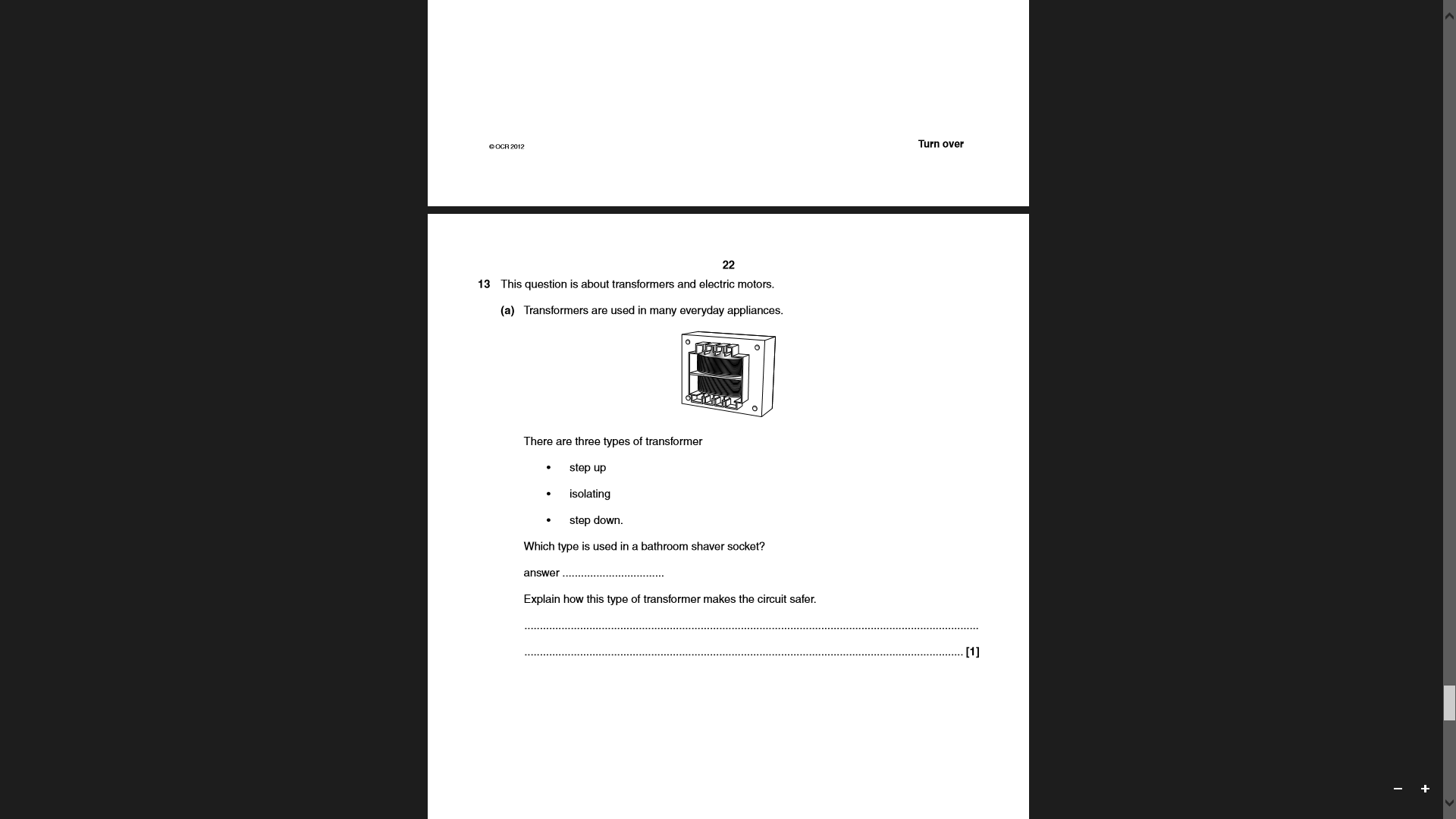


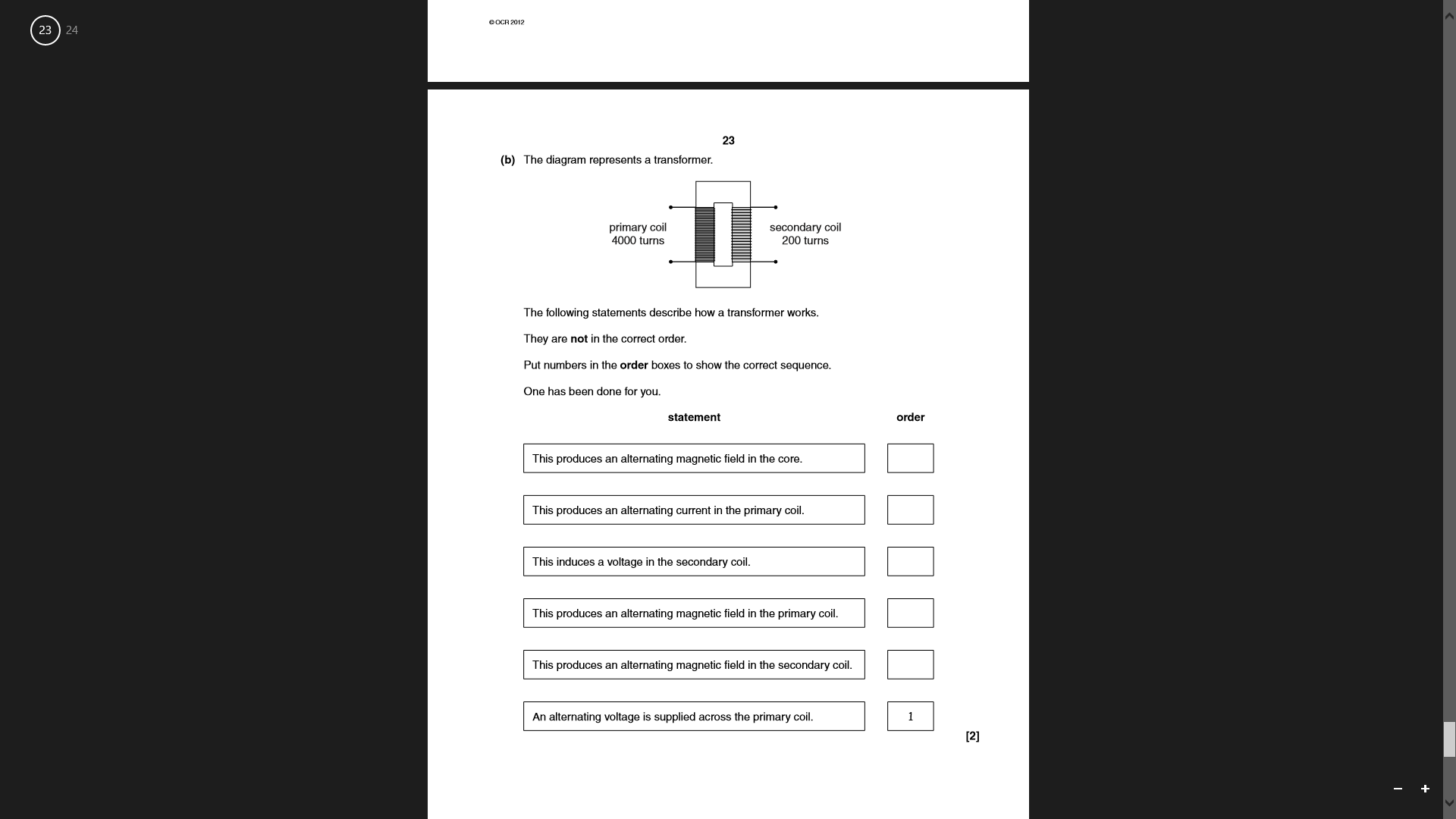
PPQ(4):



PPQ(5):

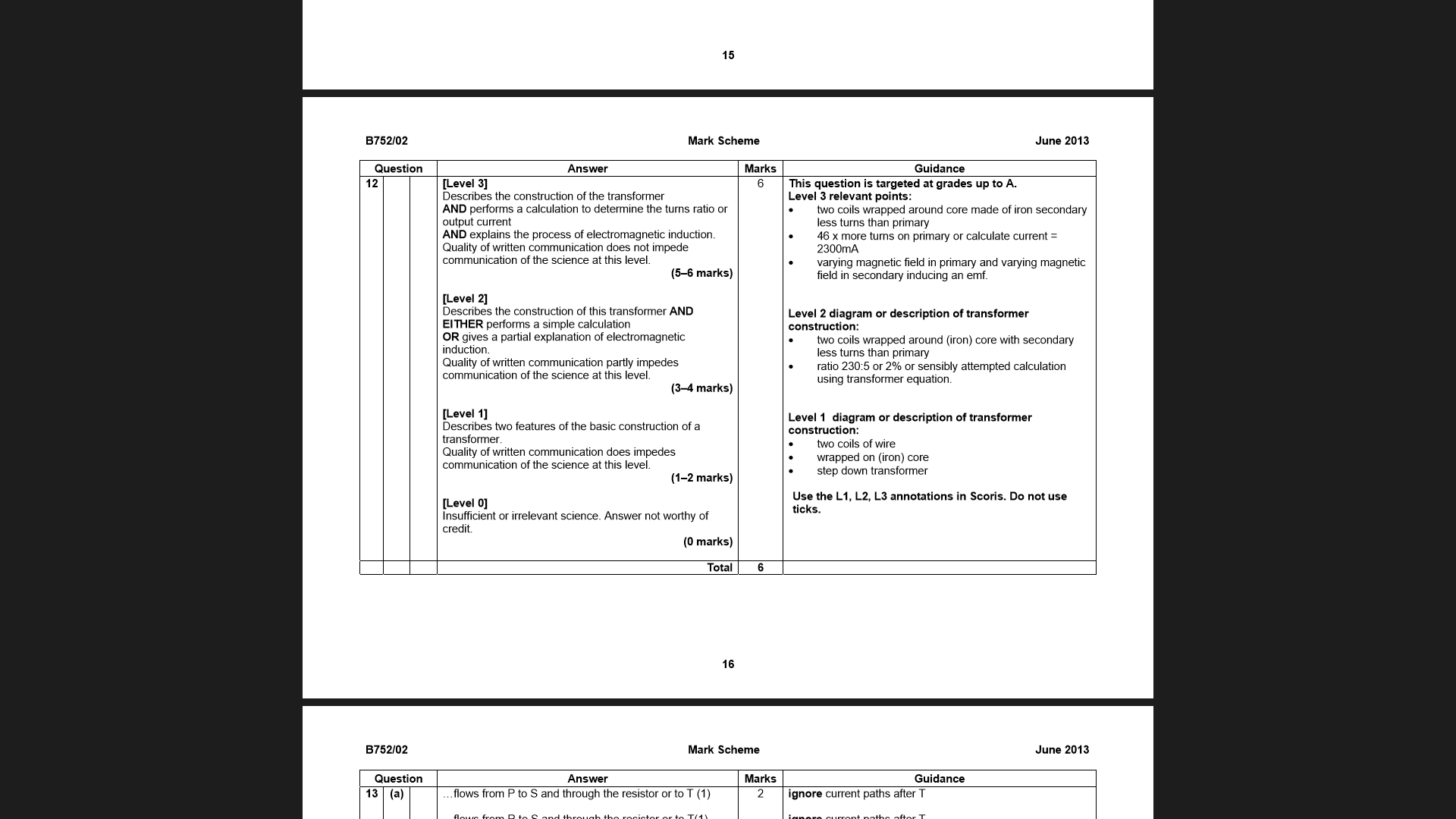




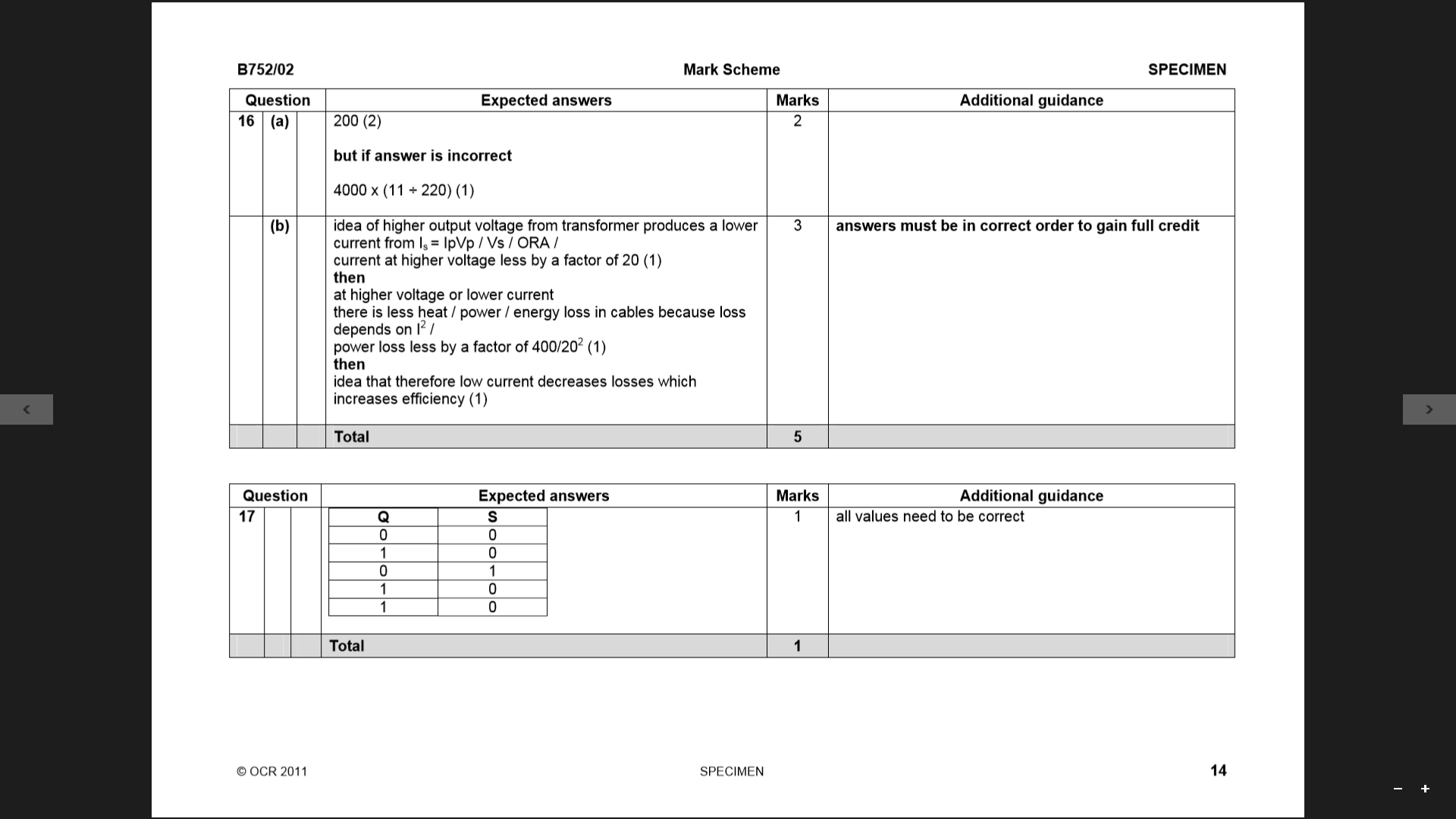


Mark Schemes:

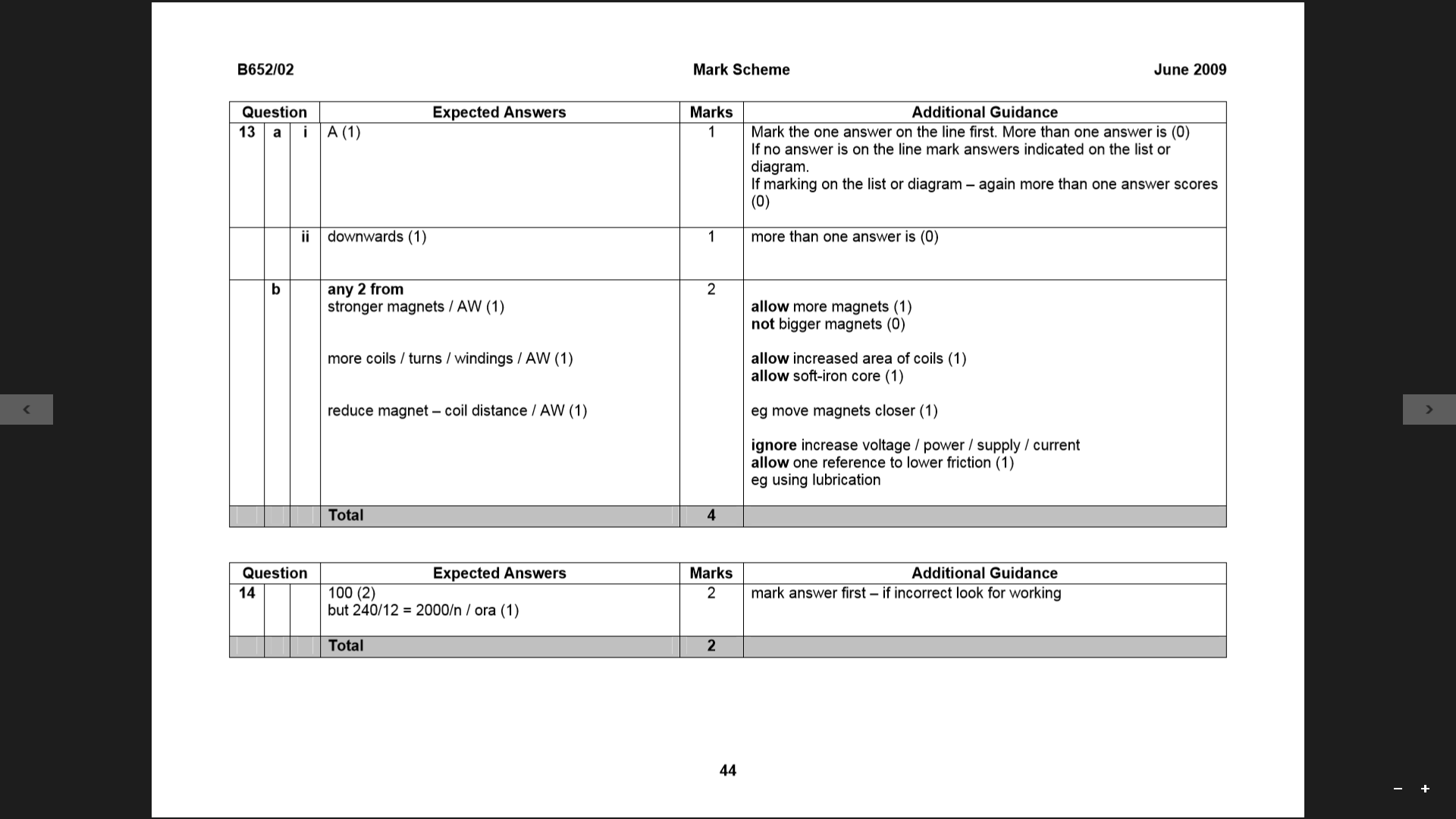
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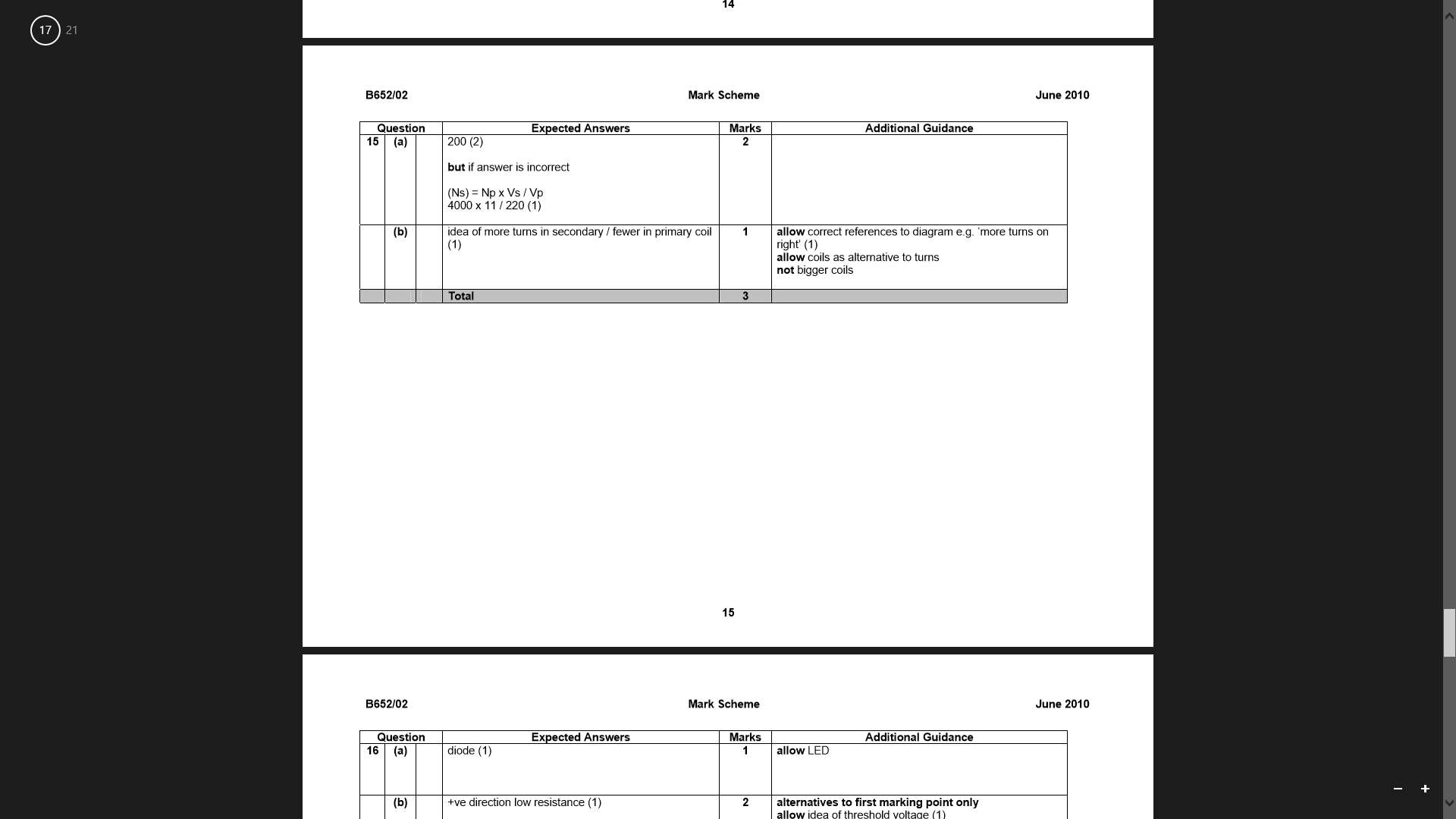
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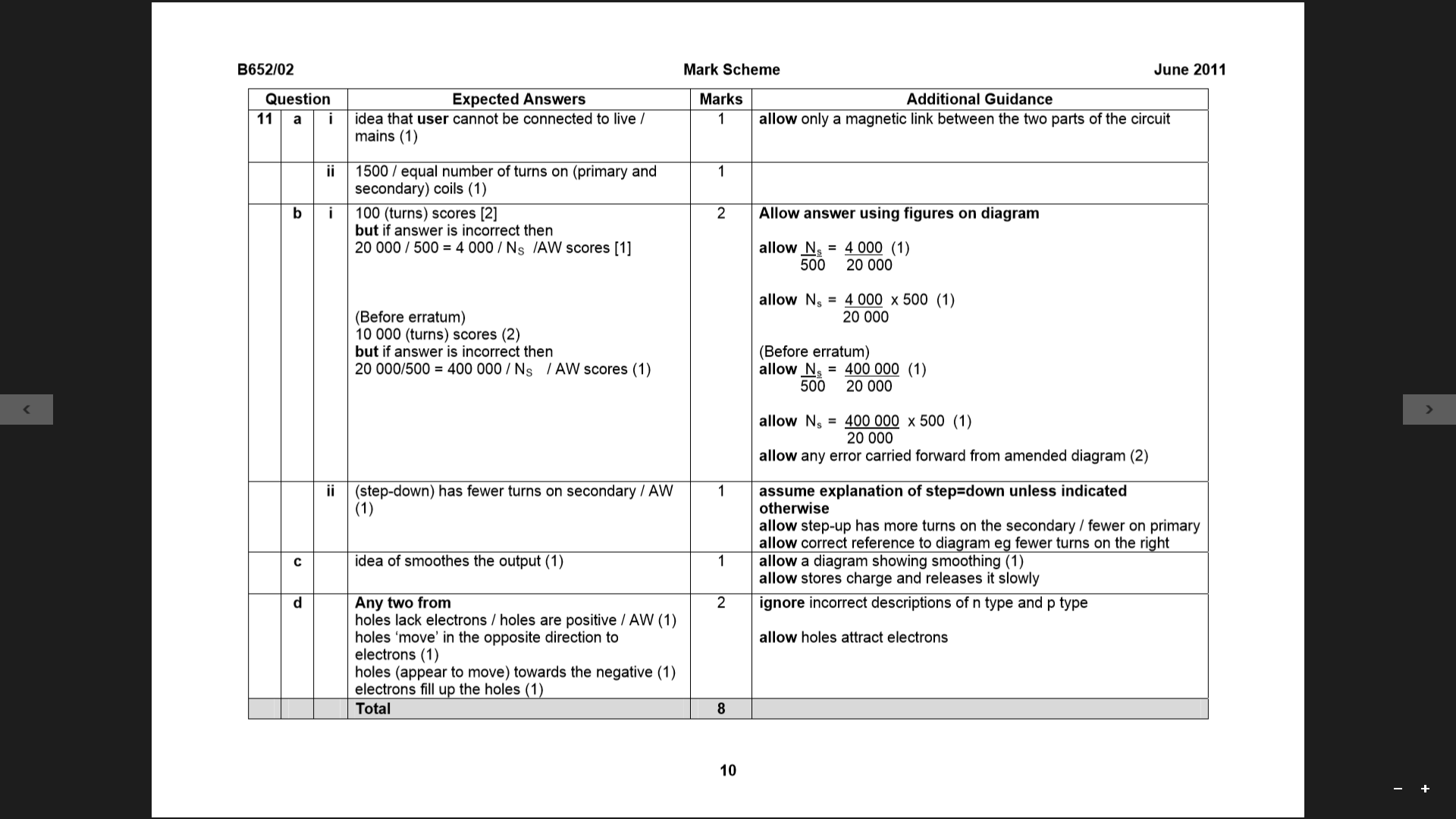
PPQ(3):



PPQ(4):



PPQ(5):



PPQ(6)

