1. Recombinant DNA is:

   ☐ a type of protein

   ☐ DNA made by joining together DNA from two different sources

   ☐ a damaged chromosome

   ☐ DNA from a single organism only

2. The polymerase chain reaction (PCR) is used to:

   ☐ amplify DNA, making millions of copies

   ☐ separate DNA by length

   ☐ cut DNA into fragments

   ☐ join two genes

3. Genetically modified bacteria can be used to make human insulin.

   ☐ True ☐ False

4. An organism whose genes have been deliberately changed, often with a gene from another species, is a genetically _____ organism.

   _____

5. Recombinant DNA is made by joining DNA from two different sources (e.g. a human gene into a bacterial plasmid).

   ☐ True ☐ False

6. The technique that makes millions of copies of a DNA sample is the _____ chain reaction.

   _____

7. An advantage of making insulin as a recombinant human protein is that it:

   ☐ is an exact human copy, safer and never in short supply

   ☐ must be taken from animals

   ☐ works less well than animal insulin

   ☐ cannot be made in large amounts

8. Insect-resistant GM cotton works because it:

   ☐ needs no water

   ☐ makes a protein that kills the insect pests

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   ☐ is resistant to a herbicide

9. Reverse transcriptase is used to:

   ☐ cut DNA at a specific sequence

   ☐ make DNA from an mRNA template

   ☐ join two DNA pieces

   ☐ copy DNA directly

10. In gel electrophoresis, longer DNA fragments travel further through the gel than shorter ones.

    ☐ True ☐ False

1. **DNA made by joining together DNA from two different sources**

   Recombinant DNA combines DNA from two sources – e.g. a human gene joined into a bacterial plasmid.

2. **amplify DNA, making millions of copies**

   PCR amplifies DNA through repeated heat/cool cycles using Taq polymerase.

3. **True**

   The human insulin gene is inserted into the bacteria, which then make exact human insulin.

4. **modified**

   A GMO carries a gene added by genetic engineering.

5. **True**

   Because the genetic code is universal, a human gene works inside a bacterium that takes it up.

6. **polymerase**

   PCR (the polymerase chain reaction) uses Taq polymerase to copy DNA over many cycles.

7. **is an exact human copy, safer and never in short supply**

   Recombinant insulin is identical to human insulin, available in quantity, and avoids animal/donor sources.

8. **makes a protein that kills the insect pests**

   The engineered cotton produces a protein toxic to insect pests, protecting the crop.

9. **make DNA from an mRNA template**

   Reverse transcriptase builds a DNA copy from mRNA – one way of obtaining the gene to transfer.

10. **False**

    False. Shorter fragments slip through the gel more easily, so they travel further towards the positive electrode.

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