INTERACTIVE QUESTIONS

**Question 1:** To which region of a gene does an RNA polymerase bind to initiate transcription?
- A) 5’ UTR
- B) 3’ UTR
- C) CDS
- D) Promoter

**Answer:** D) Promoter

**Explanation:** RNA polymerases bind to the upstream region of genes on their promoters to initiate the process of transcription.

**Key Reference:** Struhl, K. (1999). Fundamentally different logic of gene regulation in eukaryotes and prokaryotes. Cell 98, 1–4

**Question 2:** Can untranslated regions (UTRs) regulate gene expression?
- A) Yes
- B) No

**Answer:** A) Yes

**Explanation:** Although UTRs are not part of the protein-coding region of genes, they can control gene expression in various ways because they contain various elements important for the regulation of mRNA stability or translation.


**Question 3:** Which of the following processes generates multiple transcripts from the same gene?
- A) Riboswitching
- B) Alternative splicing
- C) Short-peptide translation

**Answer:** B) Alternative splicing

**Explanation:** Alternative splicing generates multiple transcripts and potentially more than one protein from the same gene. It markedly enhances the coding capacity of the genome and can increase protein diversity which plays crucial roles in controlling development and stress responses.


**Question 4:** Which of the following processes involves metabolite-sensing in noncoding portions of mRNAs to control gene expression?
- A) Alternative polyadenylation
B) Riboswitching
C) Adenosine methylation
D) Short-peptide translation

Answer: B) Riboswitching

Explanation: Riboswitches are metabolite-sensing gene-control elements that are typically located in noncoding portions of mRNAs. In eukaryotes, a well-characterized riboswitch senses the vitamin B1 derivative TPP (thiamine pyro-phosphate).


Question 5: Which of the following is an epigenetic modification?
A) Alternative polyadenylation
B) Adenosine methylation
C) Short-peptide translation
D) Nonsense-mediated decay
E) Alternative splicing in UTR elements

Answer: B) Adenosine methylation

Explanation: Adenosine methylation is a conserved epi-transcriptomic modification of mRNAs that is directed by a methyltransferase complex containing METTL3.


Question 6: Can the epigenetic status of introns affect gene expression?
A) Yes
B) No

Answer: A) Yes

Explanation: DNA methylation and other heterochromatic epigenetic marks in gene introns can be sensed by a novel protein complex that regulates alternative polyadenylation.