SIA Term I/I exam problem candidate

1. (AMSci MDCU 2023 Translated) A medical student cloned the promotor of plasmid **pBR322** (figure 1.) of *Escherichia coli* which has the origin of replication labelled "ori". He later cultured two sets the bacteria with **1) ampicillin and 2) tetracycline** (in the table). The lab result was unfortunately mixed up.

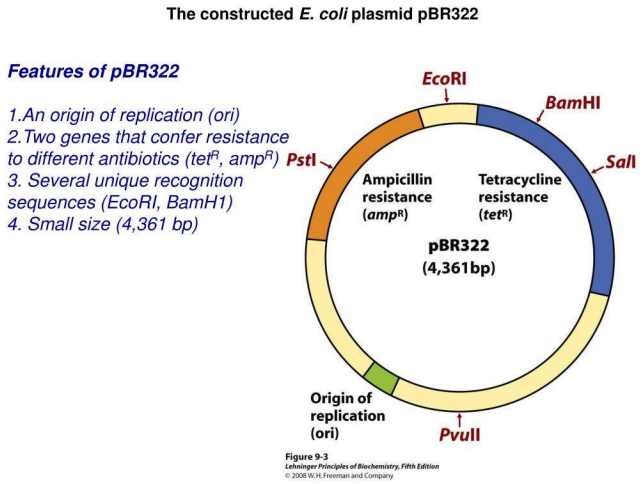
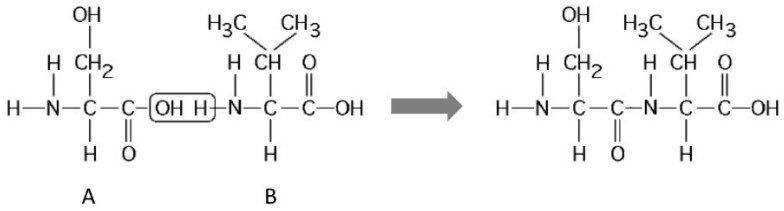


Figure 1. Diagram of the pBR322

Which of the lab result is probably the correct lab result?

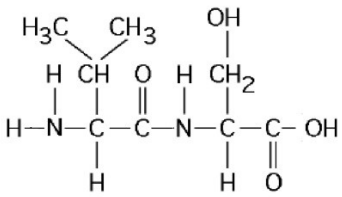
Choice	Restriction Enzyme	Successful Bacterial Culture	
		In Ampicillin infused Agar	In Tetracycline infused Agar
a)	Eco RI	+	+
b)	Bam HI	-	+
c)	Bam HI	+	+
d)	Pst I	+	-
e)	Pst I	-	+

2. (TBO 2018 Edited) From this biological chemical reaction:



Which of the following is **incorrect**?

a) This reaction is an **endergonic reaction.**
b) This reaction creates a **peptide bond.**
c) Molecule A and B can **also** form the following molecule:



d) Inside the cell, the **amino group** of molecule B must bond with tRNA prior to creating the given bond.

3. (PAT 2, Set 8 Translated) If an **O blood group, color-blind woman** has a child with **normal-sighted AB blood group man**, predict the probable phenotype of the child.

Choice	Female	Male
A	Sighted; Blood group A or B.	Color blind; Blood group A or B.
B	Color blind; Blood group A or B.	Sighted; Blood group A or B.
C	Sighted; Blood group A.	Color blind; Blood group B.
D	Color blind; Blood group B.	Sighted; Blood group A.

4. (A-Level Biology Mock-Up Exams, Pairohakul, 2023 Translated) Consider these steps of metabolizing the glucose molecule:

Steps	**Substrate-level phosphorylation**	**Production of Carbon dioxide**	**Production of NADH**	**Production of FADH2**
Step W	✓	✓	✓	✓
Step X	-	✓	✓	-
Step Y	✓	-	✓	-
Step Z	✓	-	-	-

Which of the following is incorrect?

a) Step W occurs in the matrix of the mitochondria, the powerhouse of the cell.
b) Step X occurs in the matrix of the mitochondria, the powerhouse of the cell.
c) In step X, there exist the oxidation of pyruvate.
d) Step Y occurs both in prokaryote and eukaryote alike.
e) Step Z could be the fermentation found in yeast or the muscle fiber.

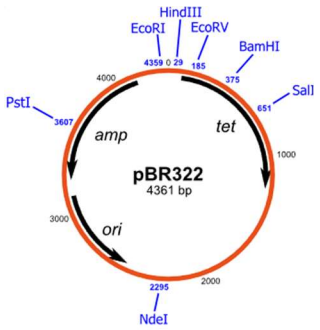
5. (POSN Qualification Round, 2022 Edited) If the sense strand of the DNA is 5'ATGACTGGCCGATAACTG3', which of the following is correct?
   a) The first amino acid translated is Leucine
   b) The polynucleotide sequence could be translated into 6 amino acids
   c) The non-sense strand has the sequence of 3'TACTGACCGGCTATTGAC5'
   d) tRNA that this amino acid uses to start with has the anticodon of 5'CAT3'

Answer Key:

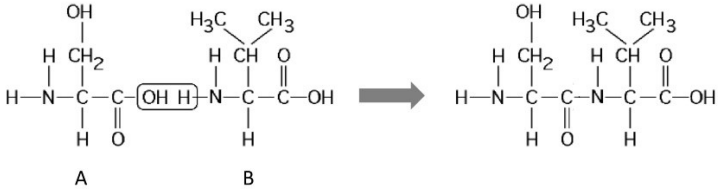
1) E, according to the provided diagram given below, there are two sites for restriction enzymes HindIII and ClaI within the promoter of the TetR gene. The direction indicated by the vector represents the direction of transcription.

   The problem specifies that we need the promoter of the plasmid labeled "ori." In the solution diagram, the relevant section is from >3000 to >2000 PstI, since the promoter is located approximately 70 base pairs upstream of the start codon.

   Based on the restriction enzyme analysis, the correct answer should be E.



2) a) true, the process is endergonic reaction since anabolism takes in energy
   b) true, the bond between two amino acids is peptide bond
   c) true, peptide bond can occur between the amino group of A's and carboxyl group of B's
   d) false, inside the cell, **carboxyl group** of B's must attach to the tRNA before making the bond in the given chemical reaction, not the amino group.



3) a), O group color-blind woman is ii with XbXb
   and AB group sighted man is IaIb with XBY

4) e), Step Z is lactic acid fermentation, found in muscle fibre (muscle cell) but not in yeast (alcoholic fermentation).

Steps	**Substrate-level phosphorylation**	**Production of Carbon dioxide**	**Production of NADH**	**Production of FADH2**
Step W (Kreb cycle)	✓	✓	✓	✓
Step X (Acetyl CoA formation)	-	✓	✓	-
Step Y (Glycolysis)	✓	-	✓	-
Step Z (lactic acid fermentation)	✓	-	-	-

5) If the sense strand of the DNA is 5'ATGACTGGCCGATAACTG3'

c) The non-sense strand has the sequence of 3'TACTGACCGGCTATTGAC5'