

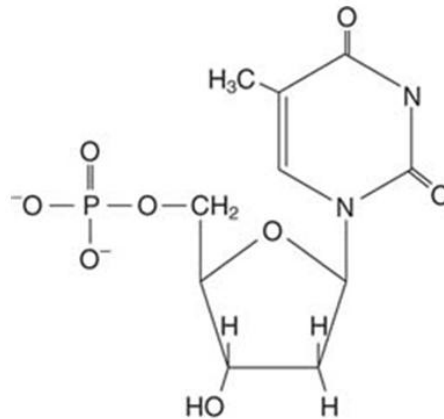
**MOLECULAR BIOLOGY Midterm 2012**

(1) The glycosidic bond that exists in nucleosides is between:

- (a) 3' carbon of sugar and N9 of adenine
  - (b) 1' carbon of sugar and N1 of guanine
  - (c) 5' carbon of sugar and N1 of cytosine
  - (d) 1' carbon of sugar and N9 of guanine
  - (e) 5' carbon of sugar and N1 of thymine
- 

(2) The following molecule resembles:

- (a) Guanosine monophosphate
- (b) Cytidine monophosphate
- (c) Adenosine monophosphate
- (d) Deoxythymidine monophosphate
- (e) Deoxyadenosine monophosphate



(3) One of the following is part of the basal transcriptional complex:

- (a) Co-activator
  - (b) RNA polymerase
  - (c) Co-repressor
  - (d) Transactivator
  - (e) NONE of the above
- 

(4) Which one of the following is less likely to have a DNA binding domain:

- (a) Myc
  - (b) Glucocorticoid receptor
  - (c) Thyroid hormone receptor
  - (d) TATA binding protein
  - (e) RNA polymerase
-



(9) The polymerase enzyme responsible for mitochondrial DNA replication is:

- (a)  $\delta$  DNA polymerase
  - (b)  $\kappa$  DNA polymerase
  - (c)  $\gamma$  DNA polymerase
  - (d)  $\beta$  DNA polymerase
  - (e)  $\zeta$  DNA polymerase
- 

(10) Which of the following is **TRUE** regarding the genetic code:

- (a) Not degenerate
  - (b) Absolutely universal
  - (c) Ambiguous
  - (d) Non-overlapping
  - (e) NONE of the above
- 

(11) Which of the following is a signal transduction tumor suppressor:

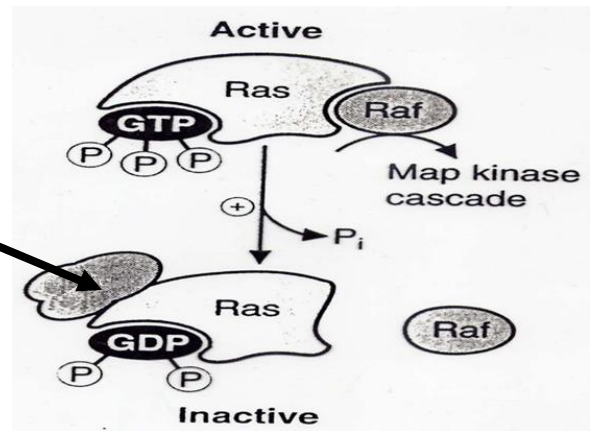
- (a) fos
  - (b) pRb
  - (c) p53
  - (d) E-cadherin
  - (e) NF-1
- 

(12) Herceptin (trastuzumab) is a recent drug (monoclonal antibody) used to treat certain types of breast cancer that are influenced by which of the following characteristics:

- (a) BRCA 1 and BRCA 2 mutations
  - (b) HER2/NEU negative
  - (c) Overexpression of erb-b2
  - (d) Translocations
  - (e) NONE of the above
-

(13) The subunit indicated by the arrow is:

- (a) GTPase
- (b) GAP
- (c) p53
- (d) Rb
- (e) E2F



(14) A characteristic of cancer cells is:

- (a) Response to contact inhibition
- (b) Response to inhibitory growth signals
- (c) Resistant to senescence
- (d) Undergo apoptosis readily
- (e) Need stimulatory growth signals

(15) A sequence that is found at the 5' part of the 3' end of the promoter, just upstream to the transcription start point and is responsible for the binding of molecules required in regulating the level of transcription in prokaryotic cells is:

- (a) Operator
- (b) Repressor
- (c) Operon
- (d) Inducer
- (e) TATA box

(16) All of the following regarding gel electrophoresis are true **EXCEPT**:

- (a) Can be used to separate DNA but not RNA
- (b) Smaller molecules move faster than larger ones
- (c) Molecules move towards the positive electrode
- (d) The higher the density of the gel, the higher the resolution
- (e) Agarose and polyacrylamide gels can be used

(17) One of the following is a Bcl-2 family ion channel forming member responsible for the formation of pores in the mitochondrial membrane needed to release cytochrome c out to the nucleus:

- (a) Bcl-2
  - (b) Bcl-x
  - (c) Bok
  - (d) Bid
  - (e) NONE of the above
- 

(18) The temperature needed by the thermostable DNA polymerase in PCR to synthesize a DNA strand is:

- (a) 94 °C
  - (b) 61 °C
  - (c) 55 °C
  - (d) 72 °C
  - (e) 14 °C
- 

(19) Which of the following types of rearrangements is most responsible for hematological malignancies:

- (a) General recombination
  - (b) Retroviral reverse transcription
  - (c) Transposable elements
  - (d) Chromosomal translocations
  - (e) Chromosomal amplification
- 

(20) Bulky adducts associated with DNA are repaired mainly by:

- (a) Nucleotide excision repair
  - (b) Base excision repair
  - (c) Mismatch repair
  - (d) Transcription coupled repair
  - (e) Translation coupled repair
-

(21) All of the following regarding introns is true **EXCEPT**:

- (a) Present only in eukaryotic cells
  - (b) Removed in the nucleus
  - (c) Spliced by snurps
  - (d) Intron shuffling results in the formation of proteins with similar functioning domains
  - (e) Possesses a 'AGGU' consensus sequence at its boundaries
- 

(22) BRCA 1 and BRCA 2 repair genes are susceptible to mutations. Multiple forms of mutations have been associated with familial breast cancer in women. What is the best method to be used to diagnose these patients who have such a mutation:

- (a) Southern blotting
  - (b) DNA sequencing
  - (c) Northern blotting
  - (d) Allele-specific PCR
  - (e) Western blotting
- 

(23) Which of the following regarding primers in eukaryotic cells is **TRUE**:

- (a) Made up of DNA subunits
  - (b) Consists of 200-300 nucleotides
  - (c) Formed by RNA primase
  - (d) Formed by the primase associated with DNA polymerase  $\alpha$
  - (e) Removed by DNase
- 

(24) All of the following is true regarding mRNA synthesis in eukaryotes **EXCEPT**:

- (a) Takes place in the nucleus
  - (b) Synthesis takes place on one strand, the template strand
  - (c) Carried out by RNA polymerase II
  - (d) Splicing is the function of snRNPs
  - (e) Synthesis starts at the ATG codon
-

(25) One of the following is a post-translational modification:

- (a) 5' G-capping
  - (b) Polyadenylation
  - (c) Splicing
  - (d) Phosphorylation
  - (e) NONE of the above
- 

(26) All of the following are true regarding polyadenylation **EXCEPT**:

- (a) Takes place in the nucleus
  - (b) 200-300 adenine residues are added to the 3' end of the mRNA
  - (c) Carried out by RNA polymerase II
  - (d) Is needed to stabilize the mRNA
  - (e) Adenine nucleotides are added after the polyadenylation sequence AAUAAA
- 

(27) All of the following are true regarding p53 **EXCEPT**:

- (a) It is a transcription factor
  - (b) It stimulates the cell cycle by inducing expression of p21 CKI
  - (c) Its function is lost in most cancers
  - (d) It stimulates GADD45 transcription
  - (e) It can induce apoptosis by activating Bax if DNA repair is not successful
- 

(28) Which of the following is not involved in regulation at the translational level:

- (a) Histone acetylase
  - (b) 5' mRNA loop
  - (c) 3' mRNA loop
  - (d) Eukaryotic initiation factors
  - (e) Ribosomes
-

(29) The genetic loci that are most recently used for DNA fingerprinting are:

- (a) VNTRs
  - (b) STRs
  - (c) snRNPs
  - (d) SNP
  - (e) RISC
- 

(30) Which of the following is true regarding the energy requirement during translation:

- (a) 4 high energy bonds are needed (ATP and GTP are used)
  - (b) 1 ATP (cleaved to ADP) and 1 GTP (cleaved to GDP) are used
  - (c) 2 ATP are produced during the process
  - (d) No energy is needed
  - (e) NONE of the above
- 

(31) Which of the following regarding aminoacyl tRNA synthetase is **TRUE**:

- (a) Attaches an amino acid to the 5' end of a tRNA
  - (b) The bond it forms between an amino acid and tRNA is a peptide bond
  - (c) Each aminoacyl tRNA synthetase is specific for a certain amino acid
  - (d) No energy is needed
  - (e) NONE of the above
- 

(32) What is the type of mutation involved when the codon CGG undergoes mutation to become AGG:

- (a) Missense mutation
- (b) Silent mutation
- (c) Frame-shift mutation
- (d) Nonsense mutation
- (e) NONE of the above

	U	C	A	G	
U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G
C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G

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(33) The process by which different mature mRNAs are produced after transcription is called:

- (a) RNA editing
  - (b) Capping
  - (c) RNA remodeling
  - (d) Polyadenylation
  - (e) Conjugation
- 

(34) All of the following regarding telomeres is true **EXCEPT**:

- (a) Telomeres consist of a repeated sequence of TTAGGG
  - (b) Telomeres are shortened by each cycle of DNA replication
  - (c) Telomerase enzyme is a RNA dependant DNA polymerase
  - (d) A 3' overhang on one strand develops due to the incapability of the primase to lay down a primer at the end of the chromosome
  - (e) Telomerase enzyme lengthens the short strand resulting in no overhangs at all
- 

(35) Spinal muscular atrophy (SMA) is an incurable autosomal recessive disease caused by a genetic defect in the SMN1 gene where a deletion mutation takes place. What is the best method to be used in order to detect this mutation:

- (a) Southern blotting
  - (b) Northern blotting
  - (c) Western blotting
  - (d) PCR and electrophoresis
  - (e) DNA microarrays
- 

(36) A severe and serious disease known as familial adenomatous polyposis (FAP) is caused by a mutation in:

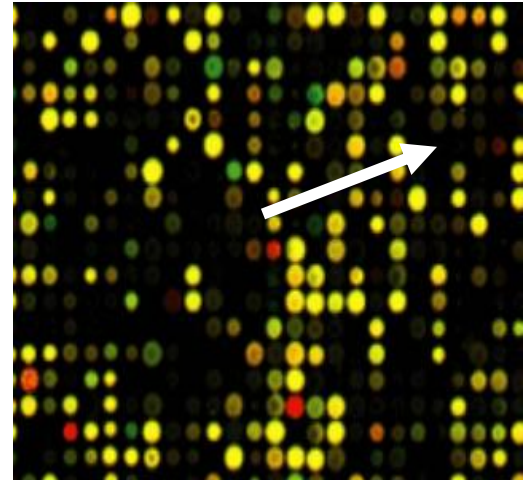
- (a) Mismatch repair genes
  - (b)  $\beta$ -catenin
  - (c) APC
  - (d) NF-1
  - (e) p53
-

(37) Which of the following is able to integrate a specific gene into a host cell:

- (a) Adenoviral vectors
  - (b) Retroviral vectors
  - (c) Liposomes
  - (d) Plasmids
  - (e) Cosmids
- 

(38) A DNA microarray has been performed for 2 different cells. RNA obtained from those two cells was allowed to hybridize with the DNA chip. What does the dark spot (pointed arrow) indicate about the oncogene expression in cells A and B:

- (a) Oncogene is expressed more in cell A
- (b) Oncogene is expressed more in cell B
- (c) Equal amounts of oncogene expression in both cells
- (d) Neither cells express the oncogene
- (e) NONE of the above



(39) Which of the following regarding the promoter region is **TRUE**:

- (a) Located downstream the first transcription site
  - (b) Many genes share the same promoter
  - (c) A promoter can be activated by more than one inducing transcription factor
  - (d) TATA box sequences are the least conserved sequences
  - (e) NONE of the above
- 

(40) Ras is considered a:

- (a) Growth factor proto-oncoprotein
  - (b) Growth factor receptor proto-oncoprotein
  - (c) Signal transduction proto-oncoprotein
  - (d) Transcription factor proto-oncoprotein
  - (e) NONE of the above
-

**MARKSCHEME**

- |        |       |
|--------|-------|
| 1. D   | 38. D |
| 2. D   | 39.C  |
| 3. B   | 40.C  |
| 4. E   |       |
| 5. E   |       |
| 6. B   |       |
| 7. A   |       |
| 8. C   |       |
| 9. C   |       |
| 10. D  |       |
| 11. E  |       |
| 12. C  |       |
| 13. B  |       |
| 14. C  |       |
| 15. A  |       |
| 16. A  |       |
| 17. C  |       |
| 18. D  |       |
| 19. D  |       |
| 20. A  |       |
| 21. D  |       |
| 22. B  |       |
| 23. D  |       |
| 24. E* |       |
| 25. D  |       |
| 26. C  |       |
| 27. B  |       |
| 28. A  |       |
| 29. B  |       |
| 30. A  |       |
| 31. C  |       |
| 32. B  |       |
| 33. A  |       |
| 34. E  |       |
| 35. D  |       |
| 36. C  |       |
| 37. B  |       |