

Name _____

Circle the right answer for the first 20 questions, which are worth 2 pts each..

1. Nuclear pre-mRNAs are synthesized by which polymerase:
 - a. Pol I
 - b. Pol II
 - c. Pol III
 - d. Pol Pot
2. The function of the conserved TATA box is to:
 - a. act as a classic enhancer for Pol II
 - b. bind AF-1
 - c. bind TFIID
 - d. define the start point for transcription by Pol II
 - e. both c and d
3. A typical eucaryotic promoter is approximately how long
 - a. 100 bp
 - b. 1000 bp
 - c. 100,000 bp
 - d. 1,000,000 bp
4. Nuclear DNA is organized into
 - a. chromoplasts
 - b. nucleopores
 - c. chromatin
 - d. nucleosomes
 - e. both c and d
5. Which of the following are functions of the mRNA 5' CAP:
 - a. to promote translation
 - b. to provide stability to the mRNA
 - c. to mediate binding of the 60S subunit
 - d. a and b
 - e. all of the above
6. 3' end formation of nuclear mRNAs requires:
 - a. nuclear pores
 - b. an endonuclease
 - c. 3'-5' exonuclease
 - d. the CAP
 - e. an inverted repeat
7. Which of the following are not involved in nuclear pre-mRNA splicing:
 - a. U2 (not the rock group or the spy plane)
 - b. snRNPs
 - c. transient assembly of the spliceosome
 - d. ATP
 - e. none of the above are correct (all are involved)
8. True or False. Alternative splicing of a pre-mRNA produces more than one mRNA from the same gene.
9. An example of alternative splicing in plants is:
 - a. SNL
 - b. RuBPCase SS
 - c. RuBPCase activase
 - d. PCR

10. Nuclear mRNA introns:
 - a. are usually over 1000 bp
 - b. begin with UC
 - c. end with AG
 - d. resemble group I introns
 - e. b and c
11. True or False. Regulation of translation is usually at the level of initiation.
12. Which of the following functions in binding the polyA-tail
 - a. eIF4E
 - b. PAP
 - c. PAB
 - d. all of the above
 - e. none of the above
13. Which of the following is controlled by light
 - a. phototropism
 - b. gravitropism
 - c. inhibition of stem elongation
 - d. a and c
 - e. all of the above
14. Skotomorphogenesis from germination in angiosperms results in a young plant
 - a. with expanded leaves
 - b. with a short hypocotyl
 - c. without photosynthesis
 - d. with etioplasts
 - e. c and d
15. Plastids from dark-grown seedlings of barley
 - a. lack the major chlorophyll-binding proteins of thylakoids
 - b. lack chlorophyll
 - c. lack RuBPCase
 - d. a and b
 - e. all of the above
16. Which of the following is true regarding protochlorophyllide reductase
 - a. it catalyzes the reduction of protochlorophyllide
 - b. it over-accumulates in the dark
 - c. it is down-regulated by phytochrome
 - d. a and b
 - e. all of the above
17. True or False. Chlorophyll-binding proteins of PSI and PSII are unstable in the absence of chlorophyll and do not accumulate in the dark.
18. Activation of the major forms of phytochrome requires
 - a. blue light
 - b. red light
 - c. far-red light
 - d. protein synthesis
19. Cryptochrome is characterized by
 - a. its blue color
 - b. FAD chromophore
 - c. homology to DNA photolyases
 - d. b and c
 - e. all of the above

20. A bZIP transcription factor
- a. Binds box VI of the *rbcS3a* promoter
 - b. dimerizes via a leucine zipper
 - c. binds the G-box of LREs
 - d. a and b
 - e. b and c

21- 25. (3 pts each) Briefly explain the significance of the following elements of gene expression and/or what they are used for:

35S minimal promoter-

enhancer -

3' NOS -

Luciferase -

CAT -

26. (10 pts) What is the general phenotype of the Det/COP/Fus mutants of *Arabidopsis*? What is the role of these genes in the dark? What about in the light? What important gene does *Det1* negatively regulate?

27. (15 pts) What are the putative second messengers for phytochrome induction of leaf/plastid development, and how were they identified? What are the signaling pathways, and what genes and/or pigments are activated by each pathway? You may add a diagram to help your explanation.

28. (15 pts) Describe the *rbcS3a* promoter and the factors that bind to it. You may add a diagram to help your explanation if you wish.

29. (10 pts) What happens to the PRP (or PvPRP) mRNA when cultured bean cells are treated with a fungal elicitor preparation? What is the mechanism (insofar as is known)? What kind of protein is encoded by the PRP mRNA, and why is its expression altered by fungal infection?