

中山大学生科院

细胞生物学期末试卷

(2000 级生物科学、生物技术、药学专业，共 164 人)

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2002 年 1 月 6 日

姓 名 _____ 班 级 _____

一	二	三	四	五	六	七	八	总 分

一、填空题 (每空 0.5 分，共 10 分)

- 分泌蛋白在内质网中通过加上 糖基 进行翻译后修饰。蛋白质在 内质网 和 高尔基体 的腔中被修饰。分泌蛋白通过 出芽 并形成 小泡 进行转运。有两种类型的包被小泡，一种是 网格蛋白，它介导 内吞外排 的运输；另一种是 COP 小泡，它介导 高尔基体与内质网间 的运输。低密度的脂蛋白通过其表面的 与细胞质膜中的 结合，然后通过泡 被运进细胞内。
- 控制芽殖酵母细胞周期有几个关卡，其中 G1 关卡主要受 START 基因的控制。
- 染色质由 DNA 包装成染色体压缩了 8400 倍，其中压缩率最高的是从 螺线管 压缩成 超螺线管，有 40 倍。
- 2002 年的生理学 / 医学诺贝尔奖颁给了两位英国科学家和一位美国科学家，以表彰他们为研究器官发育和程序性细胞死亡过程中的 所作出的重大贡献。
- 在线粒体内膜的呼吸链上有四种类型的电子载体，它们是 PQ；细胞色素；黄素蛋白；铁硫蛋白。

二、判断题 (正确的标 T , 错误的标 F,或写出必要的答案 , 共 15分)

1. Indicate whether each of the following statements is true of the G₁ phase of the cell cycle, the S phase, the G₂ phase, or the M phase. A given statement may be true of any, all, or none of the phases. (每题 0.5 分 , 共 5 分)

- (a) The amount of nuclear DNA in the cell doubles. S
- (b) The nuclear envelope breaks into fragments. M
- (c) Sister chromatids separate from each other. M
- (d) Cells that will never divide again are likely to be arrested in this phase. T
- (e) The primary cell wall of a plant cell forms. M
- (f) Chromosomes are present as diffuse, extended chromatin. S G
- (g) This phase is part of interphase. S G
- (h) Mitotic cyclin is at its lowest level. G₁
- (i) A Cdk protein is present in the cell. All
- (j) A cell cycle checkpoint has been identified in this phase. S M

2. 同一个体不同组织的细胞中 ， 核仁的大小和数目都有很大的变化 ， 这种变化和细胞中蛋白质合成的旺盛程度有关。 (T)

3. 将同步生长的 M 期细胞与同步生长的 S 期细胞融合 ,除了见到正常的染色体外 ， 还可见到细线状的染色体。 (F)

4. 在有丝分裂后期 ,通过对周期蛋白的遍在蛋白多聚化 ,介导周期蛋白被蛋白酶体降解 ,从而退出 M 期。 (T)

5. 核纤层是由核纤层蛋白 A 、核纤层蛋白 B 和核纤层蛋白 C 构成的 ,其中只有核纤层蛋白 A 与内核膜相连 ,核纤层蛋白 B 和 C 则与染色质相连。 (F)

6. 在细胞周期中 ,如果纺锤体装配不正常 ,则被阻止 G₂ 期。 (F)

7. 结合有核糖体的内质网被称为粗面内质网 ,脱去核糖体的内质网则称为光面内质网。 (F)

8. 同源异型框是一类同源异型基因表达产物中 60 个氨基酸的保守序列 , 它的突变可以改变发育的方向。 (T)

9. 叶绿体的核酮糖二磷酸羧化酶是由 16 个亚基组成的聚合体 , 其中 8 个大亚基是核基因编码的。 (F)

10. 有丝分裂器中有三种类型的纺锤体微管 , 其中星微管的可能作用是给核分裂传递信号。 (F)

11. 在减数分裂过程中 ,染色体间发生的分子重组是随机发生的。 (F)

三、选择题 (请将正确答案的代号填入括号，每题 1分，共 15分)

1. Ethyl alcohol is detoxified in the liver. You would expect alcohol to have which of the following effects on liver cells? (B)
 - a. Nuclear degeneration
 - b. Growth of the smooth ER
 - c. Increased lysosomes
 - d. Growth of rough ER
 - e. None of the above
2. Which of the following proteins would not be found in the smooth endoplasmic reticulum? (D)
 - a. Ca^{2+} -pumping enzymes
 - b. cytochrome P450
 - c. glucose 6-phosphatase
 - d. signal peptidase
3. Which of the following explains why microsomes can't be seen in cells viewed with the electron microscope? (B)
 - a. They are far too small.
 - b. They are artifacts of homogenization and centrifugation.
 - c. They are transparent to electrons.
 - d. They actually can be seen in electron micrographs of cells.
4. If you compared the proteins in a cis Golgi compartment with those in a trans Golgi compartment, you would find: (C)
 - a. the proteins in the two compartments are identical.
 - b. the proteins in the cis compartment are glycosylated and contain modified amino acids, whereas those in the trans compartment are not modified.
 - c. the proteins in the cis compartment are glycosylated, whereas those in the trans compartment are glycosylated and contain modified amino acids.
 - d. the proteins of the cis compartment are shorter than those of the trans compartment.
5. Which type of vesicle of the trans Golgi network would be most likely to carry hormones destined for regulated secretion? (B)
 - a. lysosomal vesicles
 - b. clathrin-coated vesicles

- c. non-clathrin-coated vesicles
 - d. all of the above
6. If you treated cells with a drug that interferes with microtubules, such as colchicine, which of the following would result? (D)
- a. Cell shape would be disrupted.
 - b. Mitosis and meiosis would not occur.
 - c. The intracellular location of organelles would be disrupted.
 - d. All of the above would result.
7. First you dissolve the membrane from an intact flagellum, using the detergent Triton X-100. Next you soak the axoneme in a solution containing EDTA, which removes the Mg²⁺. What remains of the axoneme after these treatments? (A)
- a. peripheral tubules only
 - b. peripheral tubules and central tubules, but no side arms or ATPase activity
 - c. peripheral tubules, central tubules, side arms, and ATPase activity
 - d. peripheral tubules, central tubules, side arms, ATPase activity, and a Membrane
8. The sarcoplasmic reticulum must have integral membrane proteins that can:
- a. release and pump Ca²⁺. (A)
 - b. bind to tropomyosin and troponin.
 - c. undergo action potentials.
 - d. contract.
9. When chromatin is treated with nonspecific nucleases, what is the length of the resulting pieces of DNA? (D)
- a. random numbers of base pairs
 - b. about 60 base pairs
 - c. about 8 base pairs
 - d. about 200 base pairs
10. What do telomeres do? (D)
- a. They protect the chromosomes from degradation by nucleases.
 - b. They prevent the ends of chromosomes from fusing with one another.
 - c. They are required for complete chromosomal replication.
 - d. all of the above
11. Cyclin concentrations are highest during which periods of the cell cycle? (B)
- a. late G1 and early S

- b. late G2 and early M
 - c. late G1 and late G2
 - d. late M and late S
12. ARF 是一种单体 G 蛋白，它有一个 GTP/GDP 结合位点，当结合有 GDP 时，没有活性。若 ARF-GDP 同(D)结合，可引起 GDP 和 GTP 的交换。
- a.GTPase; b.GTP 酶激活蛋白；
 - c.Ca²⁺-ATPase d.鸟嘌呤核苷释放蛋白。
13. 用剧烈方法分离到的叶绿体是 型叶绿体，不能 (D)。
- a. 产生 O₂ b.不能合成 ATP
 - c. 不能产生 NADPH d.不能固定 CO₂
14. 细胞的生长和分化在本质上是不同的 ，生长是细胞数量的增加、干重的增加；而细胞分化则是 :(D)
- a. 形态结构发生变化； b. 生理功能发生变化；
 - c. 生化特征发生变化； d. 以上都是正确的。
15. 真核生物的基因表达调控发生在四个水平上。 通过对 DNA 的甲基化来关闭基因的调控则是属于 (A)。
- a. 染色质活性水平的调控； b. 转录水平调控；
 - c. 转录后加工水平的调控； d. 翻译水平的调控。

四、简答题 (选做 4 题，每题 5 分，20 分)

1. How does regulated secretion differ from constitutive secretion?
2. Dynamic instability causes microtubules either to grow or to shrink rapidly. Consider an individual micro-tubule that is in its shrinking phase. What would happen if the solution contained an analogue of GTP that cannot be hydrolyzed?
3. State the conclusion that can be drawn from the following finding:

When an animal cell is treated with colchicine, its microtubules depolymerize and virtually disappear. If the colchicine is then washed away, the MTs appear again, beginning at the centrosome and elongating outward at about the rate (1 gm/min) at

which tubulin polymerizes in vitro.

4. 什么是蛋白质 N-连接糖基化和 O-连接糖基化？发生在何种部位？

5. 过氧化物酶体是怎样进行氧浓度调节的？有什么意义？

五、计算与推理 (第 1 题必做，2、3 选一题，每题 5 分，共 10 分)

1. In an electron micrograph of a human chromosome spread, you observe a thick fiber with a length of about 900 nm and an apparent diameter of 30 nm, which is expected for the solenoid structure of condensed chromatin.
What is the length in base pairs of the double-helical DNA present in this fiber? Assume, for simplicity, that there is one helical turn of the solenoid per 30 nm along the fiber.
2. One of the functions of the mitotic Cdk (the MPF protein kinase) is to cause a precipitous drop in cyclin concentration halfway through M phase. Describe the consequences of this sudden decrease and suggest possible mechanisms by which it might occur.
3. A protein that inhibits certain proteolytic enzymes (proteases) is normally secreted into the bloodstream by liver cells. This inhibitor protein, antitrypsin, is absent from the bloodstream of patients who carry a mutation that results in a single amino acid change in the protein. Antitrypsin deficiency lung tissue, because of the uncontrolled activity of proteases. Surprisingly, when the mutant antitrypsin is synthesized in the laboratory, it is as active as the normal antitrypsin at inhibiting proteases. Why then does the mutation cause the disease? Think of more than one possibility and suggest ways in which you could distinguish between them.

六、比较题（每题 5 分，共 10 分）

1. Compare and contrast the following:

cytoplasmic dynein vs. kinesin

2. 后期 A 与后期 B

七、综合问答题（任选一题，20 分）

1. 细胞内蛋白质有那些分选途径？各自的机理如何？

2. 比较裂殖酵母、芽殖酵母和哺乳动物细胞周期调控的异同。

八、附加题（每题 5 分，共 15 分）

1. State the conclusion that can be drawn from the following finding:

Extracts from nondividing frog eggs in the G2 phase of the cell cycle
were found to contain structures that could induce the polymerization
of tubulin into microtubules in vitro. When examined by immunostaining,
these structures were shown to contain pericentrin (中心粒旁侧蛋白) .

2. The signal recognition particle (SRP) is involved in regulating the
elongation of nascent secretory proteins and targeting them to the
endoplasmic reticulum. Describe an experiment in which these functions
of SRP have been demonstrated.

3. Dephosphorylation is an important event that affects cellular
structures during mitosis. Describe two of these events.