

2015 年全国华文独中数理学识比赛 - 生物科

1. 下面那一项是"转基因动物" (transgenic animal) 的最好定义? Which of the following best defines "transgenic animal"?
 - a. 一种动物含有病毒基因, 并且有能力生产大量的人类生长荷尔蒙 (human growth hormone) an animal that contains viral genes and has the ability to produce large quantities of human growth hormone
 - b. 一种动物的遗传缺陷已利用重组 DNA 治疗法来改正 an animal in which a genetic defect has been corrected using recombinant DNA therapy
 - c. 一种动物含有从第三者"父母"而来的基因, 这甚至可能是另一个不同的物种 an animal containing a gene from a third "parent", which may even be another species
 - d. 一种动物含有从一个或多个植物而来的基因 an animal containing genes from one or more plants
 - e. b 或 c either b or c

2. 在人类中, 深吸气 (deep inhalation) 是如何达到的 Deep inhalation in humans is achieved by
 - a. 肺部内肌肉的收缩 contraction of the diaphragm
 - b. 横膈膜 (diaphragm) 的收缩 contraction of muscles in the lungs
 - c. 横膈膜和胸部肌肉的放松 relaxation of the diaphragm and chest muscles
 - d. 横膈膜的放松 relaxation of the diaphragm
 - e. 横膈膜和胸部肌肉的收缩 contraction of the diaphragm and chest muscles

3. 当葡萄糖 (glucose) 利用作为能量来源时, 在何处会产生大量的 ATP When glucose is used as the energy source, the largest amount of ATP is produced in
 - a. 糖酵解反应 glycolysis
 - b. 组成乙酰辅醇 A (acetyl-CoA) 时 acetyl-CoA formation
 - c. 克雷伯氏循环 Krebs cycle
 - d. 受质层磷酸化 substrate-level phosphorylation
 - e. 电子传送磷酸化 (electron transport substrate) electron transport phosphorylation

4. 在煤炭中导致严重污染问题的最有害元素 (element) 是 The most harmful element in coal that cause serious pollution problem is
- 氮 nitrogen
 - 银 silver
 - 碳 carbon
 - 硫 sulfur
 - 氯 chlorine
5. 对有关酸碱度 (pH), 下面那一句说明是正确的 Which of the following statements about pH is (are) true?
- pH 是测量溶液中氢离子的浓度 pH is a measurement of hydrogen ion concentration
 - 一个单位 pH 的改变等于 10 倍氢离子浓度的改变 A single unit change on the pH scale is equivalent to a 10 times change in hydrogen ion concentration
 - 氢离子浓度的增加表示 pH 值的减少 An increase in hydrogen ion concentration means a decrease in pH scale units
 - 以上皆对 All of the above are true
 - 以上皆错 None of the above is true
6. 在生态系统(ecosystems) 中, _____ 的流动是单向, 但_____ 是不断的被循环。In ecosystem, the flow of _____ is one-way, while _____ are constantly cycled.
- 矿物质(minerals)..... 能量(energy) minerals.....energy
 - 遗传讯息(genetic information)..... 基因型(genotypes) genetic information.....genotypes
 - 有机化合物(organic compounds).....矿物质 organic compounds.....minerals
 - 能量..... 物质(materials) energy.....materials
 - 食物..... 能量 food.....energy
7. 下列何者不是扩散作用(diffusion)的正确说明。Which of the following statements is not true about diffusion?
- 扩散方向受浓度梯度 (concentration gradient) 的控制 The direction of diffusion is controlled by the concentration gradients

- b. 分子的大小对扩散的速率没有影响 The size of molecules has no effect on the rate of diffusion
- c. 温度升高增加扩散的速率 Increase in temperature increases the rate of diffusion
- d. 细胞膜的细孔 (pores) 控制某种物质是否可以进入细胞 Pores in the membranes of cells control whether or not some substances can enter a cell
- e. 扩散作用可在气体、液体或固体中进行 Diffusion can take place in gases, liquids or solids

8. 为何大部份的植物都是绿色? Why are (most) plants green?

- a. 因叶绿素反射绿光 chlorophyll reflects green light
- b. 因叶绿素吸收绿光 chlorophyll absorbs green light
- c. 因叶绿素基本上使用绿光作为光合作用的能量来源 chlorophyll primarily uses green light as the source of energy for photosynthesis
- d. 绿色是最好的光线作为植物的生长 green is the best color light for plant growth
- e. 因类胡萝卜素 (carotenoids) 反射绿光 carotenoids reflect green light

9. 一个种群 (population) 是 A population is

- a. 在特定环境中所需求的最小个体数 (individuals), 以维持一个可变的基因库 (gene pool) the minimum number of individuals required to maintain a varied gene pool in a given environment
- b. 能够演化的最小单位 the smallest unit that can evolve
- c. 在同一的时间中, 住在相同地点的同种 (species) 个体组 a group of individuals of the same species living in the same place at the same time
- d. 多个种群 (community) 的组合 a collection of communities
- e. b 与 c 皆对 both b and c

10. 如果父母双方都是一种致死隐性基因的携带者, 他们的小孩将会有多少机率遗传并表现此毛病 If both parents are carriers of a recessive gene, the probability that their child will inherit and express the disorder is

- a. 1/8

- b. $1/4$
- c. $1/2$
- d. $1/2 \times 1/2 \times 1/4$ or $1/16$
- e. $2/3 \times 2/3 \times 1/4$ or $1/9$

11. 双倍体生命体 (diploid organism) 进行无性生殖是 Asexual reproduction of a diploid organism would

- a. 不可能 be impossible
- b. 有减数分裂 (meiosis) involve meiosis
- c. 产生相同一样的后代 (offspring) produce identical offspring
- d. 在兄弟姐妹的后代 (sibling offspring) 中表现变异 show variation among sibling offspring
- e. 有减数分裂所产生的孢子 (spores) involve spores produced by meiosis

12. 天择 (natural selection) 最恰当的描述是 The best description of natural selection is

- a. 优胜弱败 the survival of the fittest
- b. 为生存而挣扎 the struggle for existence
- c. 最能适应环境的族群能成功繁殖后代 the reproductive success of the members of a population best adapted to the environment
- d. 在自然资源有限的环境中过度繁殖后代 the overproduction of offspring in environment with limited natural resources
- e. 在一族群中改变可继承变量的比例 a change in the proportion of inheritable variations within a population

13. 为了将一种新物种 (species) 安放在五界 (five kingdoms) 中的其中一种, 你需要知道的第一手数据是 In order to place a new species into one of the traditional five kingdoms, the first piece of information you would need to know is

- a. 如何得到食物的途径 the way in which it acquires food
- b. 它的生命周期 (life cycle) its life cycle
- c. 叶绿体 (chloroplasts) 的存在或缺乏 the absence or presence of chloroplasts
- d. 细胞核膜 (nuclear membrane) 的存在或缺乏 the absence or presence of a nuclear membrane
- e. 是否是多细胞 (multicellular) 生命体 whether the organism is multicellular

14. 下列那一项不是粪便 (feces) 中常有的成份 Which of the following is not a common component of feces?
- 肠道细菌 (intestinal bacterial)
 - 纤维素 (cellulose)
 - 饱和脂肪 (saturated fat)
 - 胆色素 (bile pigments)
 - 盐类 (salts)
15. 有机肥料 (organic fertilizers) 比化学肥料 (chemical fertilizers) 更有利是因为 An advantage of organic fertilizers over chemical fertilizers is that they
- 更自然 (are more natural)
 - 过了一段很长时间才会释放其营养成分并且不太可能会流失 (runoff) release their nutrients over a long period of time and are less likely to be lost to runoff
 - 提供营养 (nutrients) 的形式最容易给植物吸收 provide nutrients in the form most readily absorbed by plants
 - 是比较容易大量生产和运输 are easier to mass produce and transport
 - 以上皆是 are all of the above
16. 下列那一条是脊椎动物中尿通道 (passage of urine) 的正确途径 (correct pathway) Which is the correct pathway for the passage of urine in vertebrate?
- 集尿管 → (collecting tubule) → 输尿管 (ureter) → 膀胱 (bladder) → 尿道 (urethra) collecting tubule → ureter → bladder → urethra
 - 肾静脉 (renal vein) → 肾输尿管 (renal ureter) → 膀胱 → 尿道 renal vein → renal ureter → bladder → urethra
 - 肾元 (nephron) → 尿道 → 膀胱 → 输尿管 nephron → urethra → bladder → ureter
 - 皮质 (cortex) → 髓质 (medulla) → 膀胱 → 输尿管 cortex → medulla → bladder → ureter
 - 肾盂 (renal pelvis) → 髓质 → 膀胱 → 尿道 renal pelvis → medulla → bladder → urethra

17. 眼角膜 (cornea) 的功能是甚么? What is the function of the cornea?

- a. 调节进入眼睛内的光的量 (amount of light) regulate the amount of light that enters the eye
- b. 将近的景像 (close object) 调整焦距 accommodation to focus on close object
- c. 是眼睛周围的坚韧, 保护的结缔组织层 (connective tissue) tough, protective connective tissue layer surrounding the eye
- d. 作为一个固定镜 (fixed lens) 使光线弯曲的透明覆盖物 transparent covering that acts as a fixed lens to bend light rays
- e. 产生房水 (aqueous humor) 以协助在眼睛视盘上的聚焦 produce aqueous humor that helps to focus images on optic disk

18. 如果身体所有微血管 (capillaries) 在同一时间内打开 If all the bodies capillaries are open at the same time,

- a. 血压会急剧下降 blood pressure would fall dramatically
- b. 外围阻力 (peripheral resistance) 将会增加 peripheral resistance would increase
- c. 通过微血管床 (capillary bed) 时血液将会很快的流动 blood would move too rapidly through the capillary bed
- d. 回流到心脏的血液数量将会增加 the amount of blood returning to the heart would increase
- e. 气体交换的增加将会允许进行剧烈运动 (strenuous exercise) the increased gas exchange would allow for strenuous exercise

19. 什么原因导致心脏有杂音 (heart murmur) What causes a heart murmur?

- a. 弱收缩 a weak systole
- b. 房室瓣 (atrioventricular valve) 的突发关闭 (snapping closed) the snapping closed of the atrioventricular valves
- c. 泄漏的心脏瓣膜 a leaking heart valve
- d. 低血压 low blood pressure
- e. 截断从 SA 结至 SV 结的神经脉冲 (impulse) an interruption of the impulse from the SA to the AV node

20. 抗体 (antibodies) 是 Antibodies are

- a. 在入侵细菌或病毒的细胞表面上常找到的蛋白质 (proteins) 或多糖类 (polysaccharides) proteins or polysaccharides usually found on the cell surface of invading bacteria or virus
- b. 含有两个短和两个长的多肽 (polypeptide) proteins that consist of two light and two heavy polypeptide chains
- c. 在血液循环中标签外来细胞而产生补体结合 (complement fixation) 的蛋白质 proteins circulating in the blood that tag foreign cells for complement fixation
- d. 嵌入 (embedded) 在细胞膜上的蛋白质 proteins embedded in B cell membranes
- e. b, c 和 d 都是正确的 b, c, and d are all correct

21. 下列何种基因组 (genome) 已经完全 (或差不多完全) 完全序列 (sequenced)? Which of the following genomes has been completely (or almost completely) sequenced?

- a. 线虫 nematode (*C. elegans*)
- b. 人类 human
- c. 大肠菌和酵母菌 *E. coli* and yeast (*Saccharomyces cerevisiae*)
- d. 果蝇 fruit fly (*Drosophila melanogaster*)
- e. 以上皆是 all of the above

22. RNA 病毒的基因复制是利用 The replication of the genome of a RNA virus uses

- a. 宿主细胞 ((host cell) 的 DNA 聚合酶 (polymerase) DNA polymerase from the host
- b. 由病毒基因的编码的 RNA 复制酶 (replication enzymes) RNA replication enzymes coded for by viral genes
- c. 由逆转录酶 (reverse transcriptase) 所合成的 RNA reverse transcriptase to synthesize RNA
- d. 宿主细胞的 RNA RNA from the host
- e. 宿主细胞的限制核酸 (restriction nuclease) restriction nucleases from the host

23. 人类有 46 条染色体, 这染色体的数目会在何处找到 Human have 46 chromosomes. That number of chromosomes will be found in

- a. 细胞分裂后期 (anaphase) cells in anaphase

- b. 卵子和精子细胞 the egg and sperm cells
- c. 体细胞 the somatic cells
- d. 身体的所有细胞 all the cells of the body
- e. 只有在细胞中间期 (interphase) 的 G1 时 only cells in G1 of interphase

24. 糖酵解反应 (glycolysis) 的产物是 The products of glycolysis are

- a. 2 ATP, 2 CO₂, 2 乙醇 2 ATP, 2 CO₂, 2 ethanol
- b. 2 ATP, 2 NAD⁺, 2 醋酸盐 2 ATP, 2 NAD⁺, 2 acetate
- c. 2 ATP, 2 NADH, 2 丙酮酸 2 ATP, 2NADH, 2 pyruvate
- d. 38 ATP, 2 CO₂, 6 H₂O
- e. 4 ATP, 2 FADH₂, 2 丙酮酸 4 ATP, 2 FADH₂, 2 pyruvate

25. Turtle Islands 国家公园 (National Park) 是在马来西亚国家那一州内? Turtle Islands National Park is located in _____ state, Malaysia.

- a. Perak
- b. Pahang
- c. Johor
- d. Sarawak
- e. Sabah