

# 2021 年福州一中高中招生测试(“植基”计划, 数学类物理子项)

## 基础素养测试

(测试时间 6 月 27 日下午 16:30 — 18:00 满分 100 分)

考生注意: 本测试卷包括数学试卷、物理试卷、语文试卷、英语试卷。

学校\_\_\_\_\_ 姓名\_\_\_\_\_ 准考证号\_\_\_\_\_

注意: 请将选择题、填空题、解答题的答案填写在答题卡上的相应位置。

### 数学试卷(满分 40 分)

#### 一. 填空题(本大题共 8 小题, 每小题 3 分, 共 24 分.)

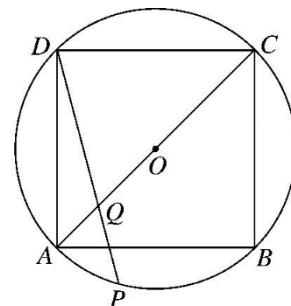
1. 若  $a^2 - 3a + 1 = 0$ , 则  $\frac{3a^2}{5a^4 + a^2 + 5}$  的值为\_\_\_\_\_.

2. 若关于  $x$  的方程  $x^4 + ax^2 + 1 = 0$  有四个不相等的实根, 则  $a$  的取值范围是\_\_\_\_\_.

3. 现有 125 颗棒棒糖, 分给若干小朋友, 不管怎样分, 都至少有 1 个小朋友分到 5 颗或 5 颗以上, 则这些小朋友的人数最多有\_\_\_\_\_个.

4. 一个袋子中装有 4 个相同的小球, 它们分别标有号码 1, 2, 3, 4. 摇匀后随机取出一球, 记下号码后放回; 再将小球摇匀, 并从袋中随机取出一球, 则第二次取出的球的号码不小于第一次取出的球的号码的概率为\_\_\_\_\_.

5. 如图, 正方形  $ABCD$  内接于  $\odot O$ , 点  $P$  在  $\overline{AB}$  上, 连接  $DP$  交  $AC$  于点  $Q$ . 若  $QP = QO$ , 则  $\frac{QC}{QA}$  的值为\_\_\_\_\_.



(第 5 题图)

6. 若  $x$  为正实数, 则函数  $y = x^2 - 3x + \frac{4}{x}$  的最小值为\_\_\_\_\_.

7. 已知抛物线  $C: y = ax^2 + bx + c$  与  $x$  轴交于  $A(1, 0)$ ,  $B(3, 0)$  两点, 且经过点  $C(4, -\sqrt{3})$ , 并与  $y$  轴交于点  $D$ . 点  $P(m, n)$  是抛物线上的动点, 当  $\angle CPD$  为锐角时, 正数  $m$  的取值范围是\_\_\_\_\_.

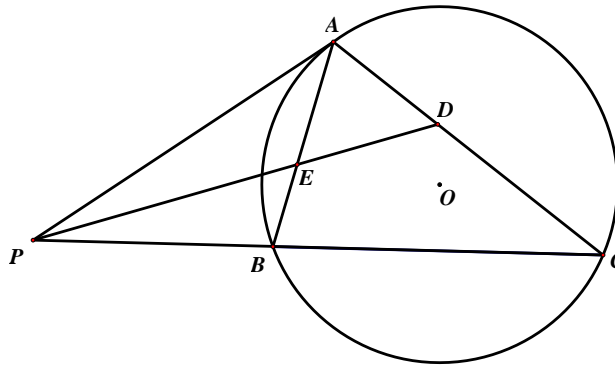
8. 若  $0 < a < 1$ , 且满足  $\left[ a + \frac{1}{30} \right] + \left[ a + \frac{2}{30} \right] + \dots + \left[ a + \frac{29}{30} \right] = 18$  (其中  $[x]$  表示不超过  $x$  的最大整数), 则  $[10a]$  的值等于\_\_\_\_\_.

二. 解答题 (本大题共 2 小题, 每小题 8 分, 共 16 分. 解答应写出文字说明、证明过程或演算步骤)

9. 如图, 过点  $A$  作  $\triangle ABC$  的外接圆  $e$   $O$  的切线  $AP$ , 交  $CB$  延长线于点  $P$ ,  $\angle APC$  的平分线分别交  $AC$ ,  $AB$  于点  $D$ , 点  $E$ .

求证: (1)  $AD = AE$ ;

(2)  $\frac{BE}{AB} + \frac{CD}{AC} = 1$ .



(第 9 题图)

10. 已知  $a_1, a_2, \dots, a_{50}$  都是正整数, 且  $a_1 + a_2 + \dots + a_{50} = 68$ , 求  $a_1^2 + a_2^2 + \dots + a_{50}^2$  的最大值与最小值.

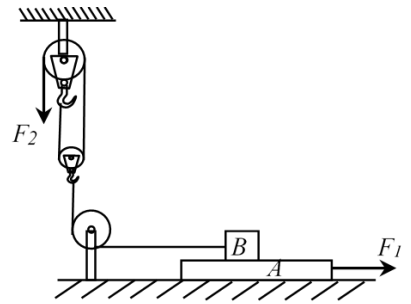
物理试卷（满分 30 分）

一. 选择题（本大题共 5 小题，每小题 4 分，共 20 分。在每小题给出的四个选项中，只有一个选项是正确的。）

1. 生物课上小福同学在“观察叶片的结构”实验中，所用的显微镜物镜焦距为  $f_1$ ，目镜焦距为  $f_2$ 。他把叶片标本放在载物台上，调整镜筒高度，当看到清晰的像时，标本到物镜的距离为  $u_1$ ，经物镜所成的像到目镜的距离为  $u_2$ 。则下列关系正确的是( )

- ①  $u_1 < f_1$     ②  $f_1 < u_1 < 2f_1$     ③  $u_2 < f_2$     ④  $f_2 < u_2 < 2f_2$   
 A. ①③      B. ②③      C. ①④      D. ②④

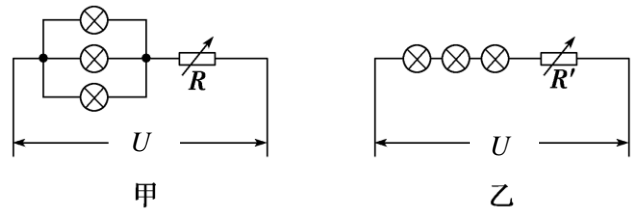
2. 如图所示，水平拉力  $F_1=16\text{N}$ ，竖直拉力  $F_2=12\text{N}$ ，绳子对  $B$  的拉力沿水平方向，此时物体  $A$  相对于水平地面保持静止，物体  $B$  在物体  $A$  上表面向左做匀速直线运动，不计绳重及滑轮的摩擦，该滑轮组的机械效率为 75%。下列说法正确的是( )



- A. 动滑轮重 9N  
 B. 如果增大  $F_2$ ，物体  $A$  可能向左运动  
 C. 物体  $A$  与地面之间的摩擦力为 2N，方向向右  
 D. 如果增大  $F_1$  ( $A$  还未滑动)，地面对  $A$  的摩擦力一直增大

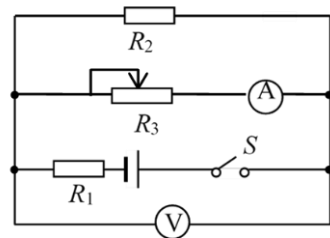
3. 把六个完全相同的小灯泡接成如图甲、乙所示的电路，两个电路两端的电压  $U$  相同，调节电阻箱使灯泡都正常发光，则下列结论中一定正确的是( )

- A.  $R$  阻值是  $R'$  阻值的 3 倍  
 B.  $R$  电压是  $R'$  电压的 3 倍  
 C.  $R$  功率是  $R'$  功率的 3 倍  
 D. 甲电路的总功率是乙电路总功率的 3 倍



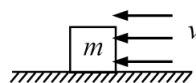
4. 如图，电源电压保持不变， $R_1$ 、 $R_2$  为定值电阻， $R_3$  为滑动变阻器， $\text{V}$  与  $\text{A}$  分别为电压表与电流表， $S$  闭合后  $R_3$  的滑片向左移动，则( )

- A.  $\text{V}$  的读数变大， $\text{A}$  的读数变小  
 B.  $\text{V}$  的读数变大， $\text{A}$  的读数变大  
 C.  $\text{V}$  的读数不变， $\text{A}$  的读数变小  
 D.  $\text{V}$  的读数变小， $\text{A}$  的读数变大



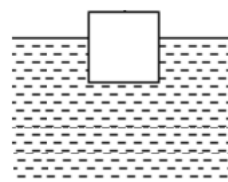
5.如图，一质量为  $m$  的正方体物块置于风洞内的水平面上，其一面与风速垂直，当风速为  $v_0$  时刚好能推动该物块。已知风对物块的推力  $F=kSv^2$ ，其中  $k$  为常量， $v$  为风速、 $S$  为物块迎风面积。当风速变为  $2v_0$  时，刚好能推动用同一材料做成的另一正方体物块，已知物块滑动时受到水平面的摩擦力与重力成正比，则该物块的质量为( )

- A.  $4m$       B.  $8m$       C.  $32m$       D.  $64m$



二. 填空题 (本大题共 3 小题, 共 10 分。)

6. (3 分) 如图所示，面积足够大的水池内水深为  $H$ ，水面上浮着一个边长为  $a$ ，重为  $G$ ，质量分布均匀的正方体物块，物块的三分之二体积浸在水中。现在用力将木块缓慢的压入水中直到池底，则从木块刚好浸没水中开始到最终压在池底的过程中，压力做的功为\_\_\_\_\_。



7. (3 分) 1648 年，帕斯卡曾经做了一个著名的实验，在一个密闭的装满水的木桶桶盖上，插入一根细长的管，向细管里灌水，结果只用了几杯水竟把木桶压裂了。如图所示，如果桶底的面积为  $S_1$ ，均匀竖直细管的横截面积为  $S_2$ ，所灌的水重力为  $G$ ，则灌水后水对桶底增加的压力为\_\_\_\_\_。



8. (4 分) 将一杯质量为  $m_0$  的热水倒入盛有质量为  $m$  的冷水的保温容器中，容器中水温升高  $10^\circ\text{C}$ 。又向容器内倒入同样一杯热水，水温又升高  $6^\circ\text{C}$ ，则  $m_0:m=$ \_\_\_\_\_。若再向容器内倒入同样一杯热水，则水温将再升高\_\_\_\_\_  $^\circ\text{C}$ 。(不计热损失)

## 语文试卷（满分 15 分）

### 一、阅读下面文言文，完成第 1 题。（3 分）

#### 陈轸之说疏

（南宋）洪迈

战国权谋之士，游说从横，皆趋一时之利，殊不顾义理曲直所在。张仪欺楚怀王，使之绝齐而献商於之地。陈轸谏曰：“张仪必负王，商於不可得而齐、秦合，是北绝齐交，西生秦患。”其言可谓善矣。然至云：“不若阴合而阳绝于齐，使人随张仪，苟与吾地，绝齐未晚。”是轸不深计齐之可绝与否，但以得地为意耳。及秦负约，楚王欲攻之，轸又劝曰：“不如因赂之以一名都，与之并兵而攻齐，是我亡地于秦，取偿于齐也。”此策尤乖谬不义。且秦加亡道于我，乃欲赂以地；齐本与国，楚无故而绝之！宜割地致币，卑词谢罪，复求其援，而反欲攻之，轸之说于是疏矣。

#### 1. 下列对本文内容的分析，不正确的一项是（ ）（3 分）

- A. 陈轸对张仪的欺骗绝不相信，认为断绝与齐国的结盟并不能得到商於之地，反而会促成齐国与秦国的联合，使楚国陷入危境。
- B. 陈轸贪图获得商於之地的近利，认为可以拿楚齐关系与秦国做交易，先表面上与齐国断交，获得秦国献上的商於之地后，再真正与齐国断交。
- C. 陈轸对楚齐结盟重要性缺乏深刻认识，认为可以在表面上与齐国断交后，割让土地给秦国并向它送上财物，而暗中却继续与齐国联合，骗取秦国献上商於之地。
- D. 陈轸对负约的秦国，认为攻打不如贿赂，楚国可以用一座著名的都城贿赂秦国，然后与它合兵攻打齐国；因贿赂秦国而失去的，可从齐国获得补偿。

### 二、阅读下面现代文，完成第 2-4 题。（12 分）

#### 粗壮的汉子

马国亮

独步在郊野，秋风阵阵的打过来，使我感着他严肃的威力。树在摇撼着，片片的树叶都在无效的挣扎之后飘落了。

“秋是顽皮的女孩”，是英国 R. Wray 说的。我竭力要戴上 R. Wray 的眼镜，想从这风底摇撼中看出这一个活泼的，胡闹顽皮的女孩的形象，结果我是失败了。我觉得，与其说秋是“顽皮女孩”，无宁说它是粗壮底汉子更为贴切点吧！

同 R. Wray 一样，我是反对别人所说的秋是悲哀的。但我也不能同意于他的以秋为顽皮的女孩，因为顽皮只能止于胡闹。

夏是一个炙手可热的残忍的暴君。秋便是从暴君的积威下面跳出来的叛逆者，一个粗壮的、耿直的大汉。他跑到都市，跑到村野，毫不畏怯地，大声呐喊着，怒吼着。他高呼着万人拥戴的口号，驱逐炎夏！

他的声音是那么的宏大，那么的粗壮，人们听了都感到兴奋。他们从这声音中得到解放了。但是另一方面，那曾在夏日煊赫一时的，现在却震栗起来了。傲岸的梧桐便是第一个唬得脸儿变了色的。

他是严肃而粗犷，他跑到城市里，摇撼着高耸的旗杆，屋尖。又跑到每一家人的窗口用力打着每一扇窗门，叫人们从床上跳起来。然后又跑到郊野，催熟了稻麦，叫农夫赶快去收割，再跑到大树的旁边，暴怒地，扯下了它的皮，有时甚至折碎了它的枝；把树叶都赶了下来，踢它们直滚到河边，河里。他是这样的不容情地怒喝与鞭挞，激起了许多草木都羞愤得红涨了脸，然后又把它们摔个半死。

秋便是这样的一个人粗壮的汉子，第一个跳出来的叛逆者，坚决而又威猛，挥舞着毫不妥协的拳头，把一切尽量破坏，虽然这力量还是不很够，但是由于他的呐喊，应声而来的冬便是他最得力的伙伴，夹了风和雪的帮助，获得了更大的力量，彻底地把一切根本破坏无遗。然后让春来重新把一切再造。

这便是秋，为了重新地建做，首先把破坏的拳头伸出来！硬干，而毫不妥协！这决不是一个顽皮的女孩子的胡闹，而是一个好汉的伟大的工作。

（选自《偷闲小品》，1935年1月5日初版）

2. 下列对本文内容与艺术特色的分析，不正确的一项是（ ）（2分）

A. 作者与英国 R. Wray 都反对秋是悲哀的说法。但 R. Wray 认为“秋”像女孩，很顽皮，会胡闹；作者认为“秋”像壮汉，很严肃，有目的地工作。

B. 本文写“春”“夏”“秋”“冬”彼此凭借征战压服完成四季轮回。在四季中，作者着力讴歌“秋”这个英勇无畏、不辞辛劳、胸怀豪情的壮汉形象。

C. 扯下树皮、折碎树枝、赶下树叶、踢到河边，这是对“秋”的正面描写；树木摇撼、树叶飘落，这是对“秋”的侧面描写。这些都表现“秋”的粗犷和威力。

D. 本文拟人手法巧妙运用，使春夏秋冬、草木风雪具有人的情态和象征性，这让我们读后似乎聆听到上世纪风云激荡的三十年代打破桎梏、重建社会的召唤。

3. 请体会文中加点词的含义，回答下面两个问题。（4分）

（1）“跳”可以改为“逃”吗？为什么？（2分）

.....

.....

.....

.....

(2) “挣扎”和“羞愤”各表现出怎样的情态？（2分）

.....

.....

.....

.....

4. “秋”伸出“破坏的拳头”“硬干”，为什么是伟大的工作？请结合文章内容分析。

（6分）

.....

.....

.....

.....

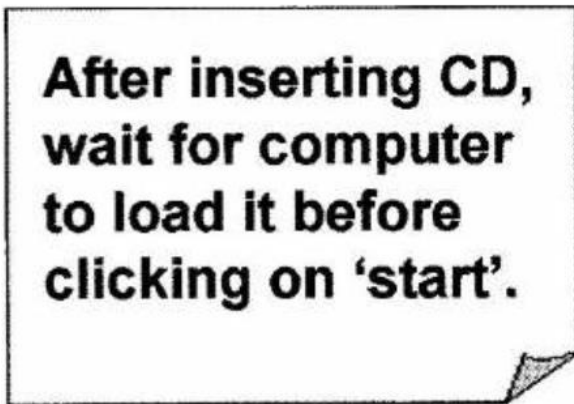
.....

.....

英语试卷（满分 15 分）

阅读下面文字。 从三个选项中，选出符合其意思的最佳答案。（满分 1.5 分）

1.



- A. Insert CD, click on 'start' and then wait.
- B. Click on 'start', insert CD and then wait.
- C. Insert CD, wait and then click on 'start'.

阅读下列短文，并做每篇文章后面的题目。从四个选项中，选出最佳答案。（每小题 1.5 分，满分 7.5 分）

A

My grandmother loves making bread and cakes and is always surprised that the rest of my family never do any baking. So my parents decided they'd take me and my younger sister on a course, so that we could all find out how to make bread—and pizza, our favourite food! We booked our places, and set off for Oakton Farm in the countryside.

It was a very long drive, and when we arrived we went straight to bed. The next morning we got up early, fed the ducks on the lake, and looked at the bull in the next field. Then we met our teacher, Michael, who seemed quite strict, and the other parents and children, who were really friendly.

The cooking part was brilliant. Michael gave us long white coats to wear, which we all felt a bit silly in. Then we all made bread rolls, mixing flour and water our hands. My sister kept complaining at first. Then even she started to enjoy it and to concentrate on following the teaching. Dad made lots of mess, I got flour on the floor and in my hair, and Mum didn't even get angry! I



took ages to make my rolls, though.

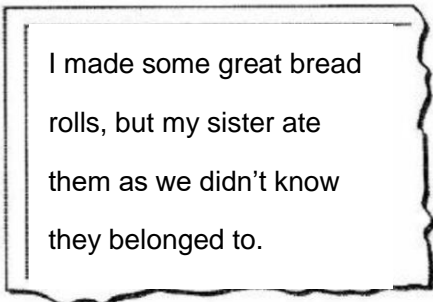
We finally put our initials on the bottom of each roll, then made some pizzas and decorated them, which was fun. And we didn't even have to do the washing-up. For something to do while the pizzas were cooking, we all went for a swim in the lake. It was fantastic. Then we went back inside and ate our pizzas. They were the best we'd ever tasted!

2. What is the writer trying to do in the text?

- A. Explain how to make the bread.
- B. Describe how he enjoyed a day with his family.
- C. Discuss the importance of knowing how to cook.
- D. Tell readers about life on a farm.

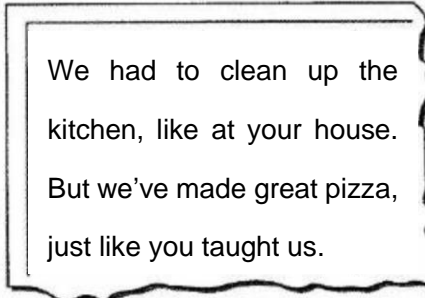
3. What might the writer write in a postcard to his grandmother?

**A**

A rectangular postcard with a scalloped bottom edge. The text is centered and reads: "I made some great bread rolls, but my sister ate them as we didn't know they belonged to."

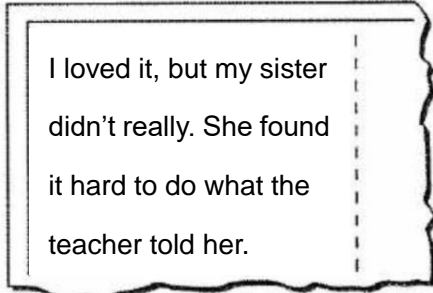
I made some great bread rolls, but my sister ate them as we didn't know they belonged to.

**B**

A rectangular postcard with a scalloped bottom edge. The text is centered and reads: "We had to clean up the kitchen, like at your house. But we've made great pizza, just like you taught us."

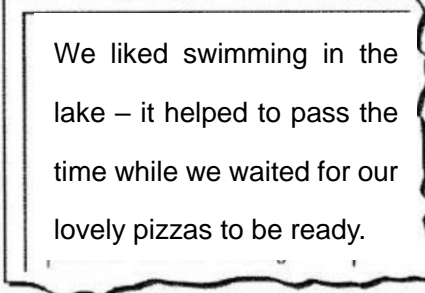
We had to clean up the kitchen, like at your house. But we've made great pizza, just like you taught us.

**C**

A rectangular postcard with a scalloped bottom edge. The text is centered and reads: "I loved it, but my sister didn't really. She found it hard to do what the teacher told her." There is a vertical dashed line on the right side of the card.

I loved it, but my sister didn't really. She found it hard to do what the teacher told her.

**D**

A rectangular postcard with a scalloped bottom edge. The text is centered and reads: "We liked swimming in the lake – it helped to pass the time while we waited for our lovely pizzas to be ready." There is a horizontal dashed line at the bottom of the card.

We liked swimming in the lake – it helped to pass the time while we waited for our lovely pizzas to be ready.

## B

Jimmy Lee likes to follow rubbish trucks. His strange habit makes sense when you consider that he's an environmental scientist who studies how to reduce rubbish, including things that fall off rubbish trucks as they drive down the road. What is even more interesting is that one of Jimmy's jobs is defending an industry behind the plastic shopping bag.

Americans use more than 100 billion plastic bags every year. So many end up in tree branches or along highways that a growing number of cities do not allow them in supermarkets. The bags are not allowed in some 90 cities in California, including Los Angeles. Seeing these headwinds, plastic-bag makers are hiring scientists like Jimmy to make people believe that their products are not as bad for the planet as most people think.

Among the bag makers' arguments: many cities with bans still allow shoppers to buy paper bags, which are easily recycled but require more energy to produce and transport. And while plastic bags may be ugly to look at, they make up a small percentage of all rubbish on the ground today.

The industry has also taken aim at the product that has appeared as its replacement: reusable shopping bags. The stronger a reusable bag is, the longer its life and the more plastic-bag use it saves. However, long-lasting reusable bags often require more energy to make. One study found that a cotton bag must be used at least 131 times to be better for the earth than plastic.

Environmentalists don't argue against these points. They hope paper bags will not be used someday, either. They want shoppers to use the same reusable bags for years.

4. What has Jimmy Lee been hired to do?

- A. Argue for the use of plastic bags.
- B. Recycle plastic shopping bags.

C. Stop things falling off trucks.

D. Help increase sales in supermarkets.

5. What does the word “headwinds” in Paragraph 2 refer to?

A. Plastic bags ending up in tree branches.

B. Plastic bags not allowed to be used.

C. Headaches caused by plastic bags.

D. Too many plastic shopping bags in use.

6. What is the best title for the text?

A. Industry, Pollution and Environment

B. Rubbish Collection and Waste Control

C. Recycle or Throw Away

D. Plastic, Paper or Neither

请用所给的关键词将下列两个句子翻译成英语。（每小题 3 分，满分 6 分）

1、多亏了我的老师们和我的父母，我取得了这么多的进步。(thanks)

2、当中国在汉唐时期开始闻名于世的时候，唐装得名。(costume, name)