Audio-visual English for Professionals

专业英语视听说

PHYSICS 1 物理 1

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Physics 1

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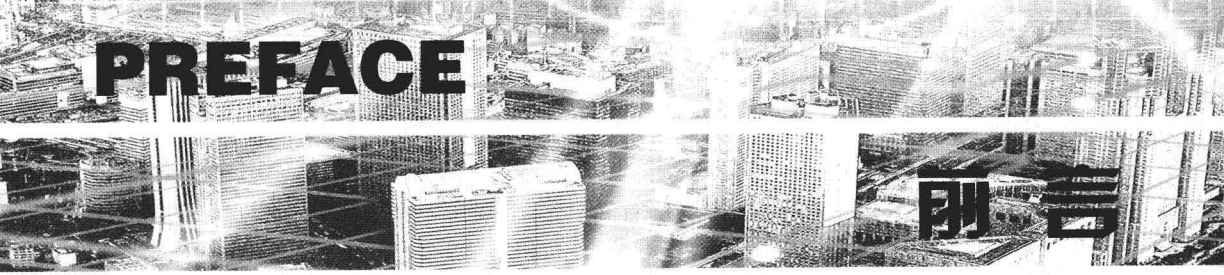


《专业英语视听说》教材是依据教育部《大学英语课程教学要求》的文件精神，聘请国内知名学者组成专家指导委员会，由全国30余所著名高等院校的外语教授和相关专业教授等教学专家联袂编写的一套视听说一体化教材。编写这套教材的目的是为了把现代科技和现代英语教学理念相结合，立足英语教学改革，更新教育观念，依靠多媒体技术和多样化课堂教学模式的支持，实现学生听、说、读、写能力的综合演练，从而改进和提高英语教学效果。全套教材以教育部最新公布的专业目录为依据，涉及文、史、经济、理、工、农、医等20多个学科方向，覆盖100多个专业领域，堪称目前国内最大规模的专业英语系列教材。

本系列教材有以下两个最突出的特点：

1. 教材内容板块精心设计，既注意借鉴国外教材的先进理念，吸纳多年来我国外语教学积累的经验，又充分照顾了中国学生的思维方式和英语学习习惯。这套教材包括视听说教学用书、DVD教学光盘和点读笔三部分（点读笔属于可选项，老师和学生可以根据自己的实际需要选择是否使用），每册书都包含16篇短文和高清晰的配套视频资料。所有的音像视频资料均由澳大利亚classroom video、德国DW、加拿大VEC等公司提供版权，并经过国内专业英语权威专家组共同筛选审定，内容涉及面广、取材新颖、难易适度，充分反映了各个学科的最新学术成果和发展方向。纸质教材板块的设计充分考虑了中国学生学习专业英语的特点和目标，内容浓缩了大量的专业词汇和专业用法，反映了各个学科的基本理论和基本概念，内容包括：①引导部分（介绍该单元主题的背景知识、教学重点、难点等）；②视听说演练（紧扣视频内容，设计视频主题讨论、完成视频问题等互动形式）；③附录文章（围绕该单元主题，介绍某一方面的学科发展、前沿知识等内容）。教材中设计了大量的练习，练习的形式活泼多样，注意与视频内容的完美结合和有机互动，能够同时调动教师和学生双方的积极性，促使他们采用多媒体、多样化课堂教学模式，开展视、听、说综合实践演练活动，充分体现英语教学的实用性、文化性和趣味性。

2. 努力把现代科技引入课堂教学实践，从而提高教学的互动性、趣味性，改善教学效果。多媒体教学是现代教学改革的一个目标，如何利用好多媒体技术，使这个技术不仅在形式上，更在实质内容上改变课堂教学模式，实现多样化教学、互动性教学，这也是现代教学改革的一个关键问题。这套教材在这个问题上进行了一次有益的尝试。配套视频资料、教材内文设计以及点读笔支持功能等都可以帮助师生在多模式教学的改革之路上大胆前行。

这套教材还支持点读笔的点读发声，变纸质无声读物为有声读物。用点读笔点击配套课本，就能发出相应清晰、标准的语音，点读笔内置扬声器，既可以外放，也可以用耳机收听，如果外接音箱就可供教师作教学示范和学生户外学习。点读笔还有复读、暂停等功能，支持 USB 下载，随身携带非常方便，满足很多自学者的需要。

本系列教材编写实施“精品战略”。首先由丛书编委会讨论确定教学大纲，然后依据大纲要求由作者编写，各分册主编统一统稿，最后由专家审定。从教材规划到教材编写、专家审稿、编辑加工、出版发行等，都有计划、有步骤地实施，层层把关，步步强化，使“精品意识”、“质量意识”贯彻全程。

值得提出的是，本系列教材在编写审定过程中，各个学科的专家对教材书稿进行了严格把关，提出精辟意见，对保证教材质量起到了重要的作用，为教材的编写出版创造了有利条件。在此表示感谢！

本系列教材在编写过程中，为了保持与英文的一致，译文均保留了英制单位。

本系列教材在吸纳传统经验，借鉴先进理念的基础上，进行了一定力度的改革与创新，在探索的过程中难免有不足之处，甚或错漏之处，敬请各教学单位、各位教学人员在使用过程中发现问题，及时提出批评指正，以便我们重印或再版时予以修改，使教材质量不断提高，更好地适应高素质、国际化专业人才的培养需要。

张勇先

2010 年 6 月

CONTENTS 目录

I. Lead – in Questions

1. Many phenomena in our daily life can be explained by physics theories. Can you give us some examples?
2. Around us there are many examples of energy converting. Can you list some of them?

II. Vocabulary

convert[kən'vɜːt] *vi.* (可)转变为
kinetic[kaɪ'netɪk] *adj.* (运) 动的，动力(学)的
momentarily['məʊməntərɪlɪ] *adv.* 即刻
swoop[swuːp] *vi.* 飞扑
velocity[vɪ'lɒsɪtɪ] *n.* 速度，速率
tumble['tʌmbl] *vi.* 翻倒，摔倒
turbulence['tɜːbjʊləns] *n.* 骚乱，动荡
eddy['edɪ] *n.* 旋转，漩涡
potential[pə'tenʃ(ə)l] *adj.* 势的，位的
mat[mæt] *n.* 垫子
vibrate[vaɪ'breɪt] *v.* (使)振动，(使)摇摆
trapeze[trə'piːz] *n.* 吊秋千
elastic[ɪ'læstɪk] *adj.* 弹性的
accelerate[æk'seləreɪt] *v.* 加速，促进
sag[sæg] *n.* 下垂，下陷
missile['mɪsaɪl, -səl] *n.* 导弹，发射物
trajectory['trædʒɪktərɪ] *n.* 【物】(射线的) 轨道，弹道
vertical['vɜːtɪkəl] *adj.* 垂直的，直立的
horizontal[ˌhɒrɪ'zɒntl] *adj.* 地平线的，水平的
parabola[pə'ræbələ] *n.* 【数】抛物线
ramp[ræmp] *n.* 斜坡，坡道
trace out 描绘出
circular['sɜːkjʊlə] *adj.* 圆形的，循环的
tangent['tændʒənt] *n.* 切线，【数】正切
at an angle 倾斜地，成一定角度
due to 由于，应归于
pendulum['pendjʊləm] *n.* 钟摆，摇锤
counterweight['kaʊntəweɪt] *n.* 平衡物
inertia[ɪ'nɜːʃjə] *n.* 惯性，惯量

III. Exercises for Listening

Exercise 1 判断下列句子的正(T)误(F)

( )1. The going up and down of a swing is the result of the mutual convertion between potential energy and kinetic energy.

( )2. During a ride on a river, both the boat and the water are lifted up to gain potential energy.

( )3. Our daily activities always go with doing work and energy convertion.

( )4. When we go upstairs, it is our food energy that changes into potential energy, and when we slide down, it is the kinetic energy that changes into potential energy.

( )5. When a trapeze artist falls into a net, it is a course of potential energy being converted into energy in the stretched elastic rope.

( )6. In the case of cable cars, the more sag of the wire cables, the higher the tension.

( )7. The path of a missile is usually a parabola.

( )8. Physics is very important in explaining different phenomena in our daily life, and easy movements like car driving can be easily explained, while complex things like missile shooting can not be so easily analyzed.

( )9. When we are going on a circular ride tightened by a rope, the force of each point you are at is along a tangent of a straight line.

( )10. The longer of a pendulum swing, the longer the duration is.

Exercise 2 翻译下列词汇

1. 势能	2. 动能
3. 流下	4. 终速
5. 河床	6. 做功
7. 摩擦倾角	8. 安全指数
9. 直线	10. 重力

Exercise 3 完成下列句子

1. The magic of a swing comes from the _____ in being momentarily stopped while high up, and then _____ to the ground at _____ speed.
2. Without even being _____ the change, _____ is being _____ into kinetic energy and _____ back again.
3. For this _____ both the boat and the water are lifted up to _____ potential energy.
4. The bottom layer of water _____ the river bed like _____. The rest of the water either _____ or tumbles depending on the speed.
5. There are different types of energy and when we _____ one to another we say _____.
6. And when we _____ we are also doing work. The mat and the metal _____ each other making their molecules _____.
7. When we slide down we _____, again by converting potential energy into _____.
8. Part of the fun in a ride is that you never know which way you are going. But, _____ as it is, rides are just _____ several simple movements combined.
9. _____ when we are _____ we keep traveling in a straight line unless a force makes us change our velocity.
10. On a ride like this the car swings out _____. This is _____ the combination of gravity and radial _____.

Exercise 4 讨论下列问题

1. Knowledge of physics can help us in our daily life. Can you give us some examples?
2. Please give some examples of potential energy being converted into kinetic energy in our daily life.
3. Analyze the trajectory theory in a missile launching.
4. Briefly explain the energy convertion in a trapeze artist show.
5. Analyze the energy converting in the course of riding a bike.

附录

课文：

This program is about physics, and perhaps surprisingly to some people also about fun. We are going to look at motion and energy. And first we'll look at potential energy being converted into kinetic energy on a swing. The magic of a swing comes from the rhythmic change in being momentarily stopped while high up, and then swooping down to the ground at ever increasing speed. As we rise again, we slow down, then kinetic energy spent, we stop. Without even being aware of the change, potential energy is being transformed into kinetic energy and back again.

For this ride both the boat and the water are lifted up to gain potential energy. As the river runs down its bed it reaches terminal velocity. The bottom layer of water sticks to the river bed like glue. The rest of the water either slides past or tumbles depending on the speed. This tumbling produces turbulence made up of eddies that spin smaller and smaller eventually becoming random molecular movement that we know as heat. The water warms up.

There are different types of energy and when we convert one to another we say work is done. When we walk up the stairs, our food energy is converted to potential energy. By walking up the stairs we are doing work. And when we slide down we are also doing work. The mat and the metal rub against each other making their molecules vibrate. Really this should be called a friction dip. We are converting potential energy into heat. Very soon the mat reaches what is known as terminal speed.

When we do work we are always applying a force over a distance. When we go up the force upwards is mg, and the distance is h. So the total work done mg · h. When we slide down we do work, again by converting potential energy into kinetic energy. The amount of work equals the friction force times the distance we slide. When a trapeze artist falls into the net it distorts. His potential energy is being converted into energy in the stretched elastic rope. Again work is done.

When she falls, once again, work is done. There is a force accelerating her over a distance. And when she stops, the same amount of work is done, but this time there is a stopping force acting over a distance. Friction within the rope eventually converts the energy to heat. Have you ever wondered why a tightrope has to be so incredibly tight? You can work it out with vectors. With 4 people causing this much sag, the tension is about ten times the mass of all the people. The less sag, the higher the tension.

When engineering structures are built with a safety factor of 6, you can see why cable cars have such large strong wire cables for a relatively light load. Part of the fun in a ride is that you never know which way you are going. But, complex as it is, rides are just made up of several simple movements combined.

Anything that is thrown is called a missile, and the path it follows is called a trajectory. So what shape is it? We'll start from the beginning. This ride takes you up and drops you. While you are falling you are accelerating downwards all the time. A picture of your vertical motion looks like this. Now let's add some horizontal motion with no acceleration. Combined they produce a half a parabola. Depending on the horizontal velocity, a whole family of parabolas can be produced.

The same rules apply to a missile shooting upwards. It's also accelerating downwards. The vertical dots represent such a missile. We can see it slowing down at the top. If the missile has a horizontal component, it will produce this part of the parabola... and then as it falls it will trace out the part we have already seen. This car is traveling at constant speed. Then the ramp throws it up into the air, and it traces out a parabola.

When we travel in a circle, we are constantly changing direction. The arms of the ride keep pulling us sideways towards the centre and we change direction. Without this pull we would go straight ahead. Normally when we are traveling along we keep traveling in a straight line unless a force makes us change our velocity. Again, a body will keep going straight ahead unless a force makes it do something else. On this circular ride you feel a force that keeps making you change direction, always to the right, which is towards the centre.

If you suddenly broke loose, which way would you fly? You will keep going along a tangent. It's a straight line. You won't fly straight out and you won't continue in a circle. On a ride like this the car swings out at an angle. This is due to the combination of gravity and radial acceleration. We know there is a force inward. There is also the tension in the rope, and the gravitational force downwards. When combined with the weight force we produce a vector diagram.

You all know of course that the duration of a pendulum swing varies with length. But there is a further complication. Will a solid rod swing faster or slower? Will a person stretched out be faster than a person who makes themselves shorter? Of course most pendulums are not straight forward. Try to estimate the effect of this counterweight on the period. How is moment of inertia involved? Well, this is the last ride for the day. Now play must end, and the work begin. Have fun!

课文参考译文：

这是一个关于物理的节目，但是令人惊奇的是，也可以说是娱乐节目。我们来看一下运动和能量。首先，来看看钢丝吊绳上的势能向动能的转化过程。摇荡的魔力来自节奏的变化：在高处有短暂的停滞，然后以不断增加的速度猛然向下冲向地面。当我们再次上去的时候，速度就慢下来了，动能耗尽，我们就停下来了。我们还来不及意识到能量的转变，势能就已经转化成了动能，然后动能又会转化为势能。

在船往上行驶的过程中，船和水都被抬高获得了势能。当河水向下冲到河床里的时候，它就会达到最大速度。河水底层就像胶水一样粘在河床上。其他部分的水要么静静地流过，要么在水道中翻腾，这是由水流的速度决定的。水流翻滚产生由漩涡组成的湍流，这些漩涡会越来越小，最终变成随机的分子运动，也就是我们所知的热量，水的温度就会升高。

能量可以分很多种，当我们把其中一种转化为了另一种时，我们就说做功完成。当我们爬上楼梯时，身体中食物的能量就转化成了势能。上楼梯的过程就是我们身体做功的过程。当我们往下滑的时候身体也在做功。这块垫子和这块金属互相摩擦使它们的分子振动，这被称为摩擦斜坡。我们正在把势能转化成热量。很快垫子就能达到最大速度。

当我们做功时，总是用一个力作用在一段距离上。当我们向上运动时，向下作用的力大小为 mg，距离就是 h。所以我们做的总功就表示为 mg · h。从滑梯上滑下的时候，我们就在做功，还是把势能转化成动能。我们做的功等于摩擦力乘以滑动的距离。当一个空中飞人掉落到网上，网就扭曲了。他的势能转化成用于弹性钢索伸展的能量。同样，他在做功。

当她落下的时候，又做功了。有一个力在一段距离上使她加速。当她停下来的时候，又做了等量的功，但是这一回有一个制动力作用在一段距离上。钢索上的摩擦力最终把能量转化成了热量。你曾想过为什么绷索会绷得那么紧吗？这可以通过矢量计算出来。当 4 个人引起绷索下垂的量是这么多的时候，绷索上的张力大约是所有人质量的 10 倍左右。下垂得越少，张力就越大。

当工程结构的安全系数为 6 的时候，你可以看出为什么缆车对一个相对较轻的负载使用了如此结实的线缆。乘坐中一部分的乐趣就是你永远不知道你的方向。尽管运动很复杂，但是它仍然是由几个简单的运动合成而来的。

被扔出去的任何物体都叫做发射物或投掷物，它运动的路径被称为运动轨迹。那么，这个运动轨迹究竟是什么形状的呢？让我们从头开始。这个运动把你带上去，然后又扔下来。当下落的时候，你一直在向下加速。你的垂直运动图就像这样。现在我们加上没有加速度的水平运动，合起来，它们生成了半个抛物线。依据（这些焰火）发

射时水平速度的不同,它们产生的抛物线能够形成一个抛物线族。

同样的规律也适用于单个发射物的向上发射。同时它也在加速下降。这些垂直方向上的点代表了这样一枚导弹。我们可以看到它在到达顶点前速度渐渐慢了下来。如果这个发射物有一个水平分量,那么它将产生抛物线的这一部分。然后,随着导弹的回落,它的轨迹就是刚才我们看见的那部分抛物线。这辆小汽车开始以恒定的速度运动。驶上斜坡后,它被扔到空中,运动轨迹是一条抛物线。

当我们做圆周运动的时候,运动方向时刻在改变。旋转木马的支臂在我们做切线运动的同时也使我们受到向心的拉力,这样我们就改变了方向。如果没有这个拉力,我们就会做直线运动。一般的,当我们在运动的时候,如果没有一个外力来改变我们的速度的话,那么我们将做直线运动。同样,一个物体也会做直线运动,除非它受到一个外力的作用来改变它的运动状态。在这个圆周运动中,你会感到总有一个向右的力使你改变方向,这个力指向圆心。

如果你突然挣脱束缚,你将飞向何方?你将沿着一条切线向前运动。它是一条直线。但你不是沿离心力的方向飞出去,也不会继续做圆周运动。这辆车行驶时以一定的角度旋转,这是由重力和径向加速度的合成造成的,我们知道车受到一个向心力,这是由绳子上的张力和向下的重力叠加而成的。把这两种力结合起来,我们得到了一个矢量图。

你们当然都知道一个单摆摆动的周期会随着摆长的不同而不同。但是这里还存在一个更复杂的问题。一个固体棒会摆动得快还是慢呢?一个人把四肢展开的速度要比他收缩四肢的速度快吗?当然大多数单摆的半径并不是直的。试着去估计一下这个平衡力对摆动周期的影响,转动惯量起了什么作用?这是今天的最后一站,现在节目该结束了,工作又开始了。祝观众朋友们玩得开心!

Keys to Exercises

Exercise 1 判断下列句子的正(T)误(F)

1. [T] 2. [T] 3. [T] 4. [F] 5. [T]
6. [F] 7. [T] 8. [F] 9. [F] 10. [T]

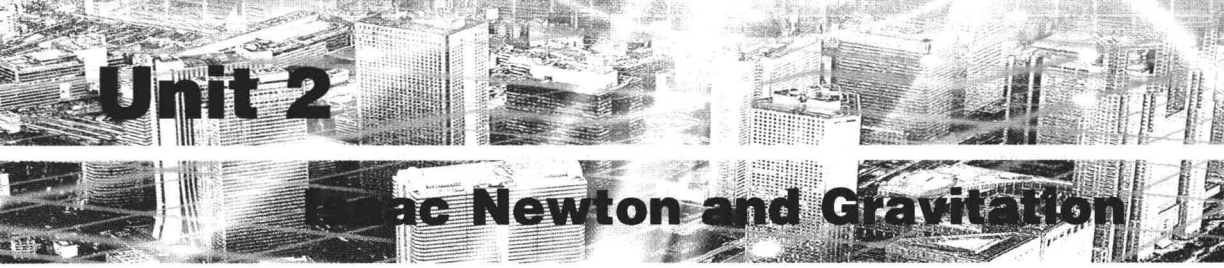
Exercise 2　翻译下列词汇

1. potential energy
2. kinetic energy
3. run down
4. terminal velocity/speed
5. river bed
6. doing work
7. friction dip
8. safety factor
9. straight line
10. weight force/gravitational force

Exercise 3　完成下列句子

1. rhythmic change; swooping down; ever increasing
2. aware of; potential energy; transformed
3. ride; gain
4. sticks to; glue; slides past
5. convert; work is done
6. slide down; rub against; vibrate
7. do work; kinetic energy
8. complex; made up of
9. Normally; traveling along
10. at an angle; due to; acceleration

Exercise 4　(略)



Unit 2 Isaac Newton and Gravitation

I. Lead – in Questions

1. Do you know Newton's three laws of classical mechanics? Can you tell us something about it?
2. Is gravitation important to our daily life? How does it influence the world?

II. Vocabulary

gravitation[ˌgrævɪˈteɪʃən] *n.* 地心吸力，引力作用
rustic['rʌstɪk] *adj.* 乡村的
lodge[lɒdʒ] *vi.* 临时住宿，寄宿(某人家)
apothecary[əˈpɒθɪkərɪ] *n.* 药剂师，药师
herb[hɜːb] *n.* 药草，香草
remedy['remɪdɪ] *n.* 药物，治疗法
matriculate[məˈtrɪkjʊleɪt] *v.* 被录取入学
trinity['trɪnɪtɪ] *n.* 三位一体，三人一个组
elliptical[ɪˈlɪptɪkəl] *adj.* 椭圆的
celestial [sɪˈlestjəl, sɪˈlestʃəl] *adj.* 天上的
intangible[ɪnˈtændʒəbl] *adj.* 难以明了的，无形的
whirlpool['(h)wɜːlpuːl] *n.* 漩涡，涡流
formulate['fɔːmjʊleɪt] *vt.* 用公式表示
external[eksˈtɜːnl] *adj.* 外部的，客观的
proportional[prəˈpɔːʃənl] *adj.* 比例的，成比例的
exert[ɪgˈzɜːt] *vt.* 尽(力)，施加(压力等)
impart[ɪmˈpɑːt] *vt.* 给予(尤指抽象事物)
halt[hɔːlt] *n.* 停止
glide[glaɪd] *v.* 滑行
prophetic[prəˈfetɪk] *adj.* 预言的
recoil[rɪˈkɒɪl] *n.* 弹回，反冲
exhaust[ɪgˈzɔːst] *n.* 排气装置
centrifugal[senˈtrɪfjʊgəl] *adj.* 离心的
hitherto[ˌhɪðəˈtuː] *adv.* 迄今，至今
Neptune['neptjuːn] *n.* 海王星
Pluto['pluːtəʊ] *n.* 冥王星
eclipse[ɪˈklɪps] *n.* 食，日蚀，月蚀
deflect[dɪˈflekt] *v.* (使)偏斜，(使)偏转
cosmic['kɒzmɪk] *adj.* 宇宙的
mint[mɪnt] *n.* 造币厂
vigorous['vɪgərəs] *adj.* 精力旺盛的，有力的

counterfeiter [ˈkaʊntəˌfɪtə(r)] *n.* 伪造者，造伪币者
optics [ˈɒptɪks] *n.* 光学
spectrum [ˈspektrəm] *n.* 光，光谱
diffraction [dɪˈfrækʃən] *n.* 衍射
divert [dɪˈvɜːt] *v.* 使高兴
whilst [waɪlst] *conj.* 时时，同时

III. Exercises for Listening

Exercise 1 判断下列句子的正(T)误(F)

( )1. Newton was born in a noble family.
( )2. Newton achieved a lot at a very young age, and he owed his success to his family and other's help and support.
( )3. Before Newton, many so-called natural philosophers had already correctly explained planet movements.
( )4. Newton was once a famous physics professor in Cambridge.
( )5. When Newton was still a student, he had already mathematical proved the force that keeps planets in their orbits and its effects.
( )6. Newton thought that the earth's gravity was the only force that keeps moon in its orbit.
( )7. Newton proved why the apple falls faster than the feather by his Law of Gravity.
( )8. Thanks to Newton's Law of Gravity, scientists had a lot of further discoveries.
( )9. Newton's Law of Gravity is inadequate when it comes to a cosmic scale, with strong gravitational fields and high velocities.
( )10. Newton's scientific achievements were not recognized by people in his time.

Exercise 2 翻译下列词汇

1. 剑桥大学	2. 天体
3. 磁力	4. 行星运动
5. 经典力学(物理学)	6. 反作用力
7. 反冲效应	8. 地心引力

Exercise 3 完成下列句子

1. This question _____ Newton to _____ of gravitation as a universal force. It became _____ one of the most important scientific works _____.
2. His mother _____ him to _____ the family farm, but little Isaac was not _____ a farmer.
3. For hours at a time he would _____ the water while the sheep just _____. He _____ sit in his room and _____ the walls with drawings of all kinds.
4. A few years later he was _____ professor of mathematics at Cambridge. But his interests _____.
5. And without _____ effort, he had _____ the mathematical proof of this force and its effects.
6. Halley realized the importance of Newton's work and _____ him to _____ his theories in a major scientific publication.
7. Among other things, this work contains the _____ which _____ the basis of _____ to this day.
8. And so it was that Newton _____ his universal law of gravity. Knowing the _____ of two bodies and _____ they were, he was able to calculate the _____ between them.
9. Using his discoveries, astronomers _____ were able to find _____ unknown planets in the _____, Neptune and Pluto.
10. The _____ also allowed Newton to explain the tides: they are the result of the moon's gravity _____ the waters of _____.

Exercise 4 讨论下列问题

1. Compared with common people, what kinds of characters should a successful scientist have? What can we learn from Newton?
2. At the end of the video, there is a sentence from Newton's note. What is the deep meaning of it? What quality of Newton can it reflect?
3. Could you please give a brief introduction of Isaac Newton's life, his scientific achievements he made, as well as their influence on the world?