МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ
БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
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«ВОРОНЕЖСКИЙ ГОСУДАРСТВЕННЫЙ
УНИВЕРСИТЕТ»

ENGLISH FOR STUDENTS OF PHYSICS

Часть I

Учебное пособие для вузов

Составитель

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Unit I. Physical Science

Physical science, like all the 1. ___ sciences, is concerned with describing and relating to one another those experiences of the world that are shared by different 2.___ and whose description can be agreed upon. One of its principal fields, physics, deals with the most general properties of 3._____, such as the 4._____of bodies under the influence of forces, and with the origins of those forces. In the discussion of this question, the mass and shape of a body are the only 5._____ that play a significant role, its composition often being irrelevant. Physics, however, does not focus solely on the gross mechanical behaviour of bodies, but shares with chemistry the goal of understanding how the arrangement of individual atoms into molecules and larger assemblies confers particular properties. Moreover, the atom itself may be analyzed into its more basic 6. _____and their interactions.

The present opinion, rather generally 7._____ by physicists, is that these fundamental particles and forces, treated quantitatively by the methods of 8.____, can reveal in detail the behaviour of all material objects. This is not to say that everything can be deduced mathematically from a small number of 9._____ principles, since the complexity of real things defeats the power of mathematics or of the largest computers. Nevertheless, whenever it has been found possible to calculate the relationship between an observed property of a body and its deeper structure, no 10._____ has ever emerged to suggest that the more complex objects, even living organisms, require that special new principles be invoked, at least so long as only matter, and not mind, is in question. The physical scientist thus has two very different roles to play: on the one hand, he has to reveal the most basic constituents and the laws that govern them; and, on the other, he must discover techniques for elucidating the peculiar features that arise from 11._____ of structure without having recourse each time to the fundamentals.

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B. Spacecraft must descend close to the surface or remain in orbit for extended periods in order to detect local gravity variations; such data had been obtained for the Moon, Venus, Mars, and Jupiter by the end of the 20th century.

C. Radio tracking makes it possible to determine the accelerations of spacecraft very accurately, and the results can be expressed either as terms in a series of spherical harmonics or as the variation of gravity over the surface. As in the case of the Earth, spherical harmonics are more effective for studying gross structure, while the variation of gravity is more useful for local features.

D. By contrast, the major planets, all of which rotate quite fast, have large equatorial bulges, and their gravity is dominated by a large increase from equator to pole. The polar flattening of Jupiter is about 10 percent and was first estimated from telescopic observation by Gian Domenico Cassini about 1664.

E. Although the Apollo astronauts used a gravimeter at their lunar landing site, most scientific knowledge about the gravitational attractions of the Moon and the planets has been derived from observations of their effects upon the accelerations of spacecraft in orbit around or passing close to them.

F. As mentioned above, Edmond Halley subsequently realized that the corresponding effect on gravity would perturb the orbits of the satellites of Jupiter (those discovered by Galileo). The results of gravity measurements are crucial to understanding the internal properties of the planets.

II. Join the word and the definition:

1. derived from
2. radio tracking
3. detect
4. concealed

5. rotate
6. subsequently
7. crucial
8. measurements

A. an amount, extent, or size determined by measuring or the act of measuring

B. find out

C. later

D. critical, very important

E. obtained

F. hidden

G. spin, turn

H. a method of observing satellites in space, involves radio equipment.

III. Explain the following: gravitational attraction, a landing site, spacecraft, radio tracking, polar flattening, elliptical, irregularity, to perturb.

IV. Comment on the following:

1. How do astronauts get the information about the gravitational attractions of the Moon? What methods do they use?
2. When and how is the variation of gravity used? How does it work?
3. What parameters does the variation of gravity depend on?
4. What causes to perturb the orbits of the planets?
5. What do you remember about Edmund Halley?

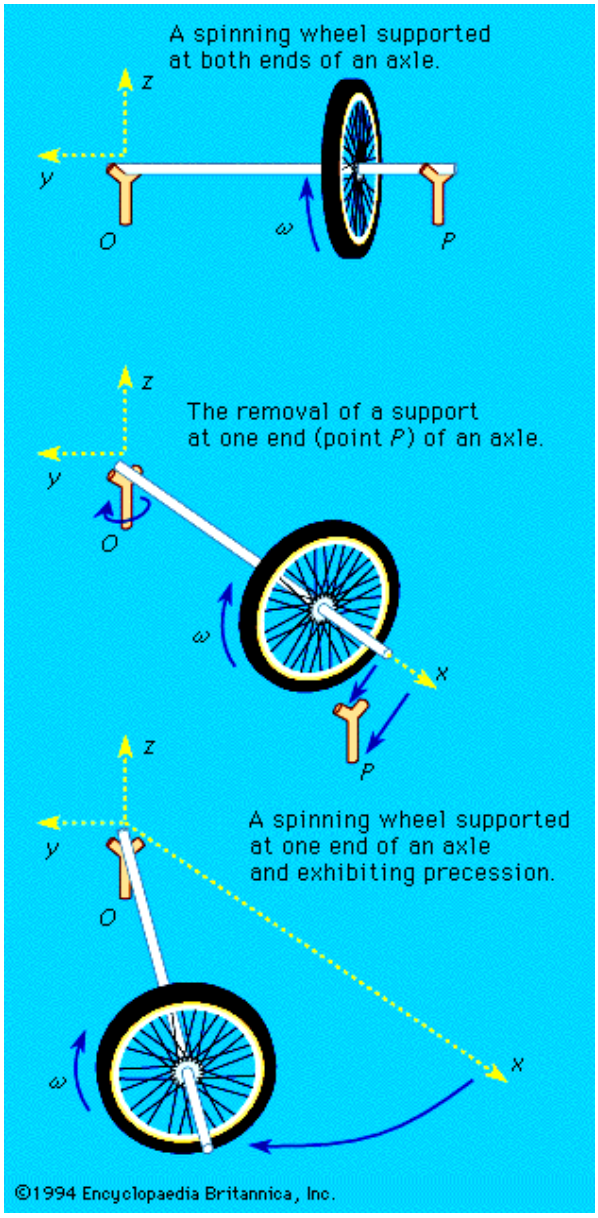
V. You are making a piece of a radio programme about gravity and the way it affects planets. Add any extra information you might need to tell your listeners.

Unit III. Spinning Tops and Gyroscopes

I. Lead-in. Can you explain why...?

1. Why does a spinning top maintain its vertical position while moving?
2. How does a circus actor manage to rotate plates on the thin poles?
3. How does a bullet maintain its direction when it comes out of a rifle?

Figure 23



II. Fill in the gaps with the terms (the list is given below):

A Figure 23 (top) shows a wheel that is weighted in its rim to maximize its moment of 1 _____ I and that is spinning with angular frequency ω on a horizontal 2 _____ supported at both ends. As shown, it has an angular momentum L along the x direction equal to $I\omega$. Now suppose the support at point P is removed, leaving the axle supported only at one end (Figure 23, middle). 3 _____, acting on the mass of the wheel as if it were concentrated at the centre of mass, applies a downward 4 _____ on the wheel. The wheel, however, does not fall. Instead, the axle remains (nearly) horizontal but rotates in the counterclockwise direction as seen from above (Figure 23, bottom). This motion is called gyroscopic 5_____.