Your name:

UNIVERSITÄT LEIPZIG

Fachgebundene Hochschulzugangsberechtigungsprüfung

Schriftliche Teilprüfung: Fremdsprache Englisch
April 2016

Before you begin, read the following guidelines carefully:

- Only use the paper provided by university. Please write your name on the top left-hand corner of each sheet of paper, i.e. on both the task sheets and the writing paper. Do not forget to number all sheets of your writing paper.
- You may use either an English monolingual dictionary or a bilingual dictionary (English – German / German – English). In addition, a German spelling dictionary such as *Duden* can be used.
- Please write legibly. If you want to correct something, you cross out the wrong part neatly. Try not to over-use ink erasers.
- For tasks 1.2 and 2: Please answer these questions in complete sentences. Do not quote directly from the text. Do pay careful attention to the word limits as required and add your word count at the end of each task.
- Please choose only one topic in task 2.
- Any attempt to deceive will lead to your immediate expulsion from the examination. In that case, your performance will be marked 5.0 *(*insufficient = fail).
- Your writing time to take this exam is 4 hours, i.e. 240 minutes.

Grading:

- **content:**

Task 1.1 *Reading comprehension: true or false*	10 pts.		
Task 1.2 *Reading comprehension: Working with the text*	10 pts.		
Task 2. *Composition*	10 pts.	→	30 pts.

- **English language competence** in task 1.2 *Reading comprehension: Working with the text* and task 2 *Composition*:

accuracy (correct standard English morphology, syntax, vocabulary, and spelling)	20 pts.		
style, complexity, fluency	10 pts.	→	30 pts.

- **task 3 *Translation*** 30 pts.

total maximum: 90 pts.

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1. Reading Comprehension

To solve tasks 1.1 and 1.2., read the following text carefully.

The Man Who Said Einstein Was Wrong, And Was Right

It takes a brave man to reject a scientific paper by Albert Einstein. But that's what the physicist Howard Percy Robertson did in 1936, as editor of the journal Physical Review. Einstein was so enraged that he never published there again.

If Einstein were alive today, he might thank Robertson, who saved the great scientist from retracting the most far-reaching prediction of his theory of relativity - the existence of gravitational waves. The first direct detection of Einstein's waves was announced this week to much fanfare and celebration. Scientists say the waves emanated from the powerful collision of two black holes. The finding was hailed as a vindication, though Einstein was one of the biggest doubters of his own idea. He flip-flopped several times over the years, said physicist Daniel Kennefick, co-author of An Einstein Encyclopedia. The tale ended well, thanks to Einstein's wisdom in knowing when to be sure, when to have doubts, when to ignore his doubters and when to listen to them and regroup. The idea grew out of Einstein's relativity theories. He published his special theory of relativity in 1905, changing the way scientists understood space and time. He published the general theory in 1915 and changed the way scientists understood gravity, redefining it as the effect of curves in space and time.

In February of 1916, Einstein predicted that if space and time could have lumps and bumps, then perhaps those bumps could move, said Kennefick. "After all, we can see moving hills and valleys on the surface of water that we call waves, so if gravity curves space-time, why couldn't it create moving distortions?"

Einstein understood that these waves would be subtle. Only something dramatic could emit a signal strong enough to provide a chance to detect them - something like a merger of black holes. But Einstein was skeptical about the existence of black holes at all, even though others predicted them based on his theory.

These doubts didn't mean that Einstein was insecure. He boldly predicted that the curve of space would produce a visible bending of starlight around the sun.

That prompted the world's best astronomers to see for themselves, waiting for a 1919 eclipse of the sun to make the behavior of faint light from background stars measurable. When asked how he'd feel if relativity was disproved by the eclipse experiment, Einstein famously replied: "Then I would feel sorry for the dear Lord. The theory is correct anyway."

Einstein knew when to be certain, said Kennefick. He had a good physical intuition, and he also knew when he was ranging around in new territory.

So it's perhaps understandable that he would at one point decide to quash his gravitational-wave prediction in a high profile journal article. In hindsight, one could see Robertson's rejection as a double negative - a negation of Einstein's doubt that added up to positive support for his original idea.

Einstein didn't see it that way. According to historical accounts, he was furious. He submitted the paper to another journal - the more obscure journal of the Franklin Institute in Philadelphia, not that anything with Einstein's name on it could be obscure by that point in history. But before Einstein could reject his gravitational waves in that journal, Robertson indirectly nudged him to change his mind back again.

Robertson did this by becoming acquainted with one of Einstein's assistants, Leopold Infeld, said Kennefick. It doesn't appear that either Infeld or Einstein knew about Robertson's role in rejecting the paper, as it's traditional for reviewers to be anonymous. Robertson explained to

Infeld why he thought Einstein was right the first time. That led to discussions between Einstein and Infeld, and before the paper came out, Einstein made radical revisions so that it supported rather than refuted the now famous forecast.

Who knows how history would have unfolded had Robertson let Einstein publish the original anti-gravitational-wave paper. It certainly helped to have Einstein on the favored side of things when it came to the difficult task of detection. The project that eventually led to a positive signal cost $1.1 billion over a period of 40 years. Called the Laser Interferometer Gravitational-Wave Observatory, or LIGO, it qualifies as the most expensive apparatus ever funded by the National Science Foundation.

The concept for LIGO was put forward by the MIT physicist Rainer Weiss back in 1972. The experiment is in the form of twin detectors, one near Hanford, Washington and one near Livingston, Louisiana. In each one, a laser beam travels down L-shaped pipes, each arm stretching two and a half miles. In theory, a gravitational wave would move mirrors at the ends of these pipes an inconceivably small distance that could be measured by the lasers.

The apparatus went through two iterations - a preliminary version that went up in 2010 and a more advanced version that went online in September of 2015. Within a few days of starting operation, the advanced detector registered something, which the physicists say fits the description of two black holes colliding.

The physicists say they can read a lot of information into the signal. They were able to discern the masses of the black holes - 29 and 36 times the mass of the sun - and a distance to the event of 1.3 billion light years from earth.

If they detect more collisions, the project could give scientists a more refined measure of distances to faraway objects and a better handle on the scale and expansion rate of the universe. They may observe other collisions between massive objects known as neutron stars, and learn about the nature of these exotic objects. And then there's always the hope that they will find something completely unexpected.

Words: 951

New Delhi Television Limited (NDTV)/World/Faye Flam, Bloomberg: February 13, 2016, 21:13 IST

1.1 Reading comprehension: true or false

Are the following statements true or false? Tick the right box. (10 pts.)

		true	false
1	In his theory of relativity, Einstein foresaw the existence of gravitational waves.	☐	☐
2	He published this prediction in the journal 'Physical Review'.	☐	☐
3	It was Howard Percy Robertson who was able to convince him of this publication.	☐	☐
4	Throughout his life, Einstein always believed in the existence of gravitational waves.	☐	☐
5	According to Einstein, such waves are so extremely weak that just something remarkable like the fusion of black holes could create an indication of them.	☐	☐
6	Thus, in 1919, astronomers met to wait for the solar starlight to be deformed a little.	☐	☐
7	Finally, Einstein published the withdrawal of his prediction of gravitational waves in the journal of the Franklin Institute in Philadelphia.	☐	☐
8	The man who discussed the theory's pros and cons with Einstein was the physicist Daniel Kennefick.	☐	☐
9	The apparatus LIGO started its operation in 1972 but it lasted till September 2015 to receive a positive signal.	☐	☐
10	The signal proved that Howard Percy Robertson was right to reject Einstein's withdrawal of his hypothesis.	☐	☐

1.2 Reading comprehension: Working with the text

Respond to the following questions in complete English sentences, using approximately 40 words in each answer. Keep to the information given in the text, but do not quote directly.

1.2.1 What was the event that led to excitement among physicists and in the media in September 2015? (3 pts. on content)

1.2.2 Which role did Howard Percy Robertson play in the twisted story whether or not Einstein would publish the denial of his theory? (4 pts. on content)

1.2.3 What is the purpose, and what the shape of LIGO? How does it work? (3 pts. on content)

2. Composition

Write 350 to 400 words on <u>one</u> of the following topics.

2.1 Discuss:

As a scientist, you should always believe in your own ideas and never allow any doubts.

2.2 Provide arguments and substantiate why an instrument that cost $ 1.1 billion is worth its price, even in the face of hunger and social upheavals in many parts of the world.

2.3 Usually, the media pay much attention to new discoveries in natural sciences, technology and medicine. New concepts in the humanities like philosophy and cultural science, however, are seldom met with a comparable echo. Comment on this phenomenon. Why is this so?

3. Translation

Translate the following part of the article *Google AI takes on the 'world's Go champion'* into German.

You have to feel for Lee Se-dol. He speaks quietly. His fingers shake as he talks to the BBC. He is nervous. But you would be if you were representing the human race against a very clever machine. Mr Lee is considered the world champion at baduk (or Go as the board-game is known through much of the world) thanks to his number of wins over the past decade.

He's due to play a computer with a programme devised by Google. The winner will take away about a million dollars - not that AlphaGo, as the programme is called, will be able to spend it. AlphaGo has already beaten the European champion but, experts say, this is easy-peasy compared to taking on the masters in Asia - it would be like beating some non-league football side compared to playing Barcelona.

Mr Lee is the reigning human champion of the planet (though a Chinese contender is running close). "Playing against a machine is very different from an actual human opponent," the world's Number 1 told the BBC. "Normally, you can sense your opponent's breathing, their energy. And lots of times you make decisions which are dependent on the physical reactions of the person you're playing against.

words: 205

Stephen Evans BBC News, Seoul; 7 March 2016