

## Public Acceptance of Evolution in India

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### ABSTRACT

The public acceptance of evolution has been in debate since the initial publication of Darwin's theory about the origin of species. According to public polls carried out in several countries, the public acceptance of evolution is low in many countries with high degree of religiosity. Although religiosity is high in India, public acceptance of evolution has never been objectively evaluated in India yet. The rejection or denial of evolution could possibly offer the risk of shifting science education to common or popular beliefs and ideas, for example, creationism and intelligent design.

The aim of the present study was to find out the public acceptance of evolution in India by carrying out a primary survey in 14 Indian states. Based on the answers by the participants, the study explored the variables related to public acceptance of evolution namely, gender, religion, politics and occupation. The results showed that 68.5% participants accepted evolution, which is very high compared with other countries of the world. 90% of the participants also agreed that the earth is older than 10,000 years. Plausible reasons for high acceptance of evolution in India are being discussed in this paper.

**KEYWORDS:** Evolution, Acceptance, Creationism, Religion, Politics, Public Understanding of Science (PUS)

### Introduction

Biological evolution, simply put, is descent with modification of different lineages from a common ancestor. It occurs when there is a change in heritable traits of a biological population over successive generations (Scott, 2009). More technically, evolution is defined as change in allele frequency of a population over time. It accounts for remarkable similarities and differences among living organisms as a result of biological processes such as mutation, natural selection, symbiosis, gene transfer, and genetic drift.

The theory of evolution by natural selection was first proposed by Charles Darwin in his 1859 book *On the Origin of Species* (Darwin, 2004). However, repeated public polls have shown that despite being a well-established and accepted scientific theory (with empirical evidences), it is not accepted by a significant portion of populations across the world (Miller, Scott, & Okamoto, 2006).

The surveys concerning the public acceptance of evolution began to be conducted in the United States in 1985 when national samples of US adults were asked to respond with true, false, 'not sure' or 'does not know' to the statement "human beings developed from earlier species of animals" (Johnson & Peeples, 1987; Miller et al., 2006). The result of this survey was compared with survey data from 32 European countries in 2005 and a national survey in Japan in 2001. Interestingly, the results showed that significantly more number of adults in Japan and 32 European countries (except Turkey) accepted evolution than did American adults.

According to Pew Research Analysis (Centre, 2013), only 32% American adults accept evolution of human beings through natural processes, while 33% of the whole population entirely reject it. Surprisingly, these numbers have remained nearly the same as they were in 2009 when the same questions were asked by the center. What accounts for the American reservation about the concept of evolution and consequently low acceptance at an international level? It is perhaps connected to the high prevalence of religiosity and conservatism in the American population.

Views about human evolution are highly polarized in the American population. White evangelical Protestants (64%) are the most expected to reject evolution. Catholics and mainstream Protestants commonly accept theistic evolution, which sees God as the creator of everything through laws of nature (Paterson & Rossow, 1999; Rosengren, Brem, Evans, & Sinatra, 2012). According to the most recent studies, religiosity is negatively associated with acceptance of evolution for most of the countries (Heddy & Nadelson, 2013), the principal reason why highly religious countries such as Turkey have a high degree of public rejection of Darwinism.

The evolution issue remains highly politicized in the United States; there are growing partisan differences in beliefs about evolution among political parties. Republicans are less likely than either democrats or political independents to accept that humans evolved over time. According to the left-right spectra widely used throughout the world to classify political parties, leftist attributes include egalitarianism, anti-religion, anti-nationalism, multi-culturalism, and restrained economy. On the other hand, the right wing attributes include anti-egalitarianism, freedom of religion, nationalism, uni-culturalism and free economy (Bast, 2016). In such a political spectra, leftists are expected to be more accepting of evolution rather than the rightists. In the United States, republicans are usually identified as rightists with one of the hallmark being commitment to conservative Christian values.

The Indian population is thought to be highly religious, with the 2011 census revealing 99.8% of the population to be part of major religions in the country; merely 0.2% had no religion. However, the extent of public acceptance of evolution by the Indian population had never been subjected to a systematic assessment in India other than a small survey (“Darwin Survey”) conducted by the National Center for Science Education (NCSE) and British Council in 2009 as part of the observance of the bicentenary of the birth of Charles Darwin (Branch, 2009).

According to the ‘Darwin Survey’, Indians, with 37% (sample size= 909), topped in the list of countries with the portion of adults who opinionated that evolutionary theories alone be taught in the school. For the question “To what extent do you agree or disagree that it is possible to believe in a God and still hold the view that life on earth, including human life, evolved over time as a result of natural selection?”, Indians topped the list, with 85% affirmative responses. For the question “To what extent do you agree or disagree that enough scientific evidence exists to support Charles Darwin’s Theory of Evolution”, Indians again topped the list, with 77% affirmative responses. However, this survey tested no finer variables, including state of domicile, gender, educational level, occupation, religiosity, politics, etc.

Another ingenuous and noteworthy survey had been the longitudinal study by (Raza, Singh, & Dutt, 2000). Instead of carrying out surveys from various places pan India, the authors attempted the survey from the *Kumbh Mela* and *Ardh Kumbh Mela*, two of the largest religious congregations in India happening every six years at Allahabad. Such a survey would reveal fairly representative population trends of North India. However, such samples are likely to be comprising wholly of Hindus. Authors compared the *Kumbh* samples with that from Mangolpuri, a slum near New Delhi. The longitudinal survey included questions from Astronomy, Climate, Geography, Agriculture and Health Sciences. Scientifically correct responses for the question pertaining to ‘evolution of man’ were reported to be 10.6% at *Kumbh* in 1989, 12.8% at Mangolpuri in 1990 and 12.8% at *Ardh Kumbh* in 1995. The authors have come up with the ‘cultural distance model’ to explain the trends in public understanding of science after their longitudinal assessment of data over 25 years (Raza & Singh, 2017).

In order to examine the public acceptance of evolution in India, a systematic primary survey involving the public was carried out in this study.

### **Methodology**

Based on the investigation of the literature, a print questionnaire was designed and distributed to the public [S1]. Care was taken to make the questionnaire as simple as possible. There were a total of four questions, all in multiple choice formats, modified from that used by earlier authors (Johnson & Peeples, 1987; Miller et al., 2006).

While subjective open-ended questions would have been more meaningful, such a method was not adopted for two reasons. First, open-ended questions would tremendously increase chances of bias as well as low response rates in the survey (Kiesler & Sproull, 1986) and two, an entirely new set of questions would make it impossible for a comparison of our findings with similar surveys conducted elsewhere.

The study included respondents from 14 states of India namely Punjab, Jammu, Himachal Pradesh, Delhi, Haryana,

Uttar Pradesh, Rajasthan, Chhattisgarh, Madhya Pradesh, Gujarat, Assam, Maharashtra, Odisha, and Kerala. The mode of the survey was offline, using print questionnaires. The questionnaire in English was translated to prevalent regional languages before the survey was attempted. The data collection began in August 2015 and ended in April 2016.

After the data collection, the population of respondents was divided based on their answers to the questions 1 and 2 pertaining to categories, namely, state, gender, religion, politics, and occupation. Subsequently, they were segregated on the basis of their responses to question 3 and 4 of the questionnaire. The data analysis was done using GraphPad prism 6 (Prism, 1994)

## Results

A total of 1706 persons responded to the statement “Human beings as we know them developed from earlier species of animals”. Overall, 68.5% of the Indian population accepted evolution by choosing affirmatory response to the third question of the survey. A majority of the males (71.5%), females (68.8%), religious (67%), non-religious people (74%), leftists (60.6%) and rightists (65.8%) answered correctly and accepted evolution to be definitely true (Figs. 1 and 2).

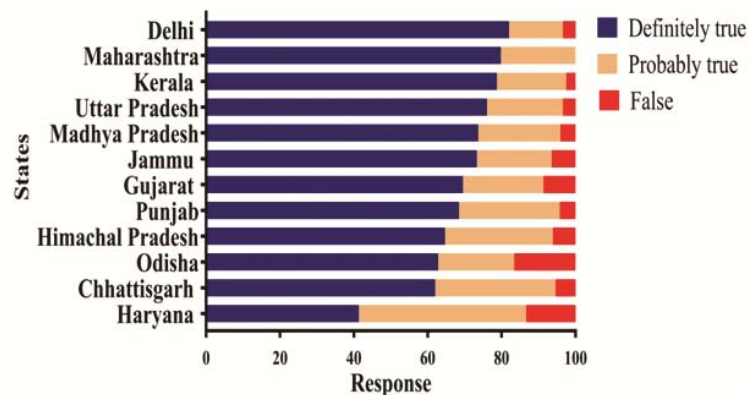


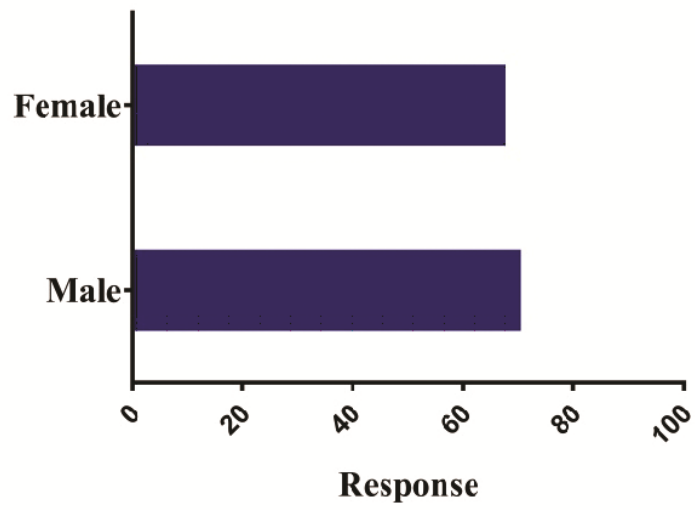
Fig. 1: Public acceptance of evolution in various states, as measured by the responses to the question “Human beings as we know them developed from earlier species of animals”.

Teachers (85.8%) and school students (73.81%) were most likely to accept evolution to be definitely true, followed by senior citizens (68.69%), college students (64.8%), unemployed adults (64.19%) and employed adults (58.16%). The three states most likely to accept evolution were Delhi (82%), Maharashtra (79.76%) and Kerala (78.68%). The public acceptance of evolution was found least likely in Haryana (41.34%).

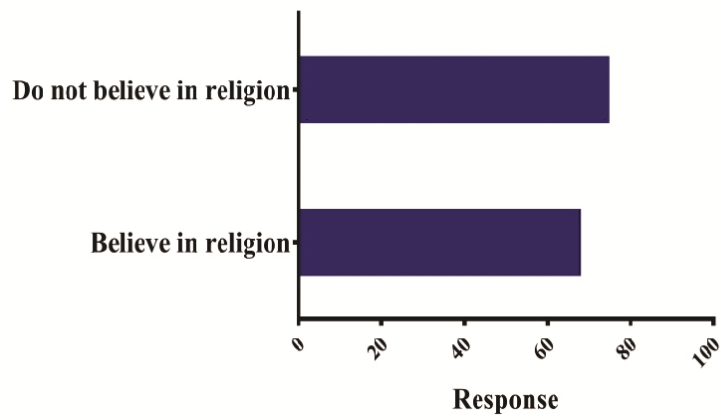
Unpaired Student's t-test with a 95% confidence interval was carried out to determine whether there are statistically significant differences between the means in two unrelated groups. The analysis showed that there was a significant difference ( $P < 0.0001$ ) between the means of the two groups of the population, the one which accepted evolution to be "definitely true" (68.5%) and the other that rejected the concept of evolution by saying that it is "definitely false" (5.5%). No statistically significant differences were observed between believers vs. non-believers ( $P = 0.12$ ), and leftists vs. rightists ( $P = 0.50$ ).

A total of 1639 citizens responded to the fourth question, "Which of the following do you believe in: Earth is younger/older than 10,000 years." Overall, 90% of the Indian population accepted the old earth by choosing 'older than 10,000 years' response in survey. A majority of males (89%), females (88.91%), religious (89%), non-religious (89%), rightists (83.60%), as well as leftists (75.84%) answered that "Earth is older than 10,000 years" (Fig. 3). In addition, a majority of school students (91.39%), university/college students (85.14%), teachers (84.94 %), employed adults (84.48 %), unemployed adults (86.76%) and senior citizens (95.33%) answered this question correctly.

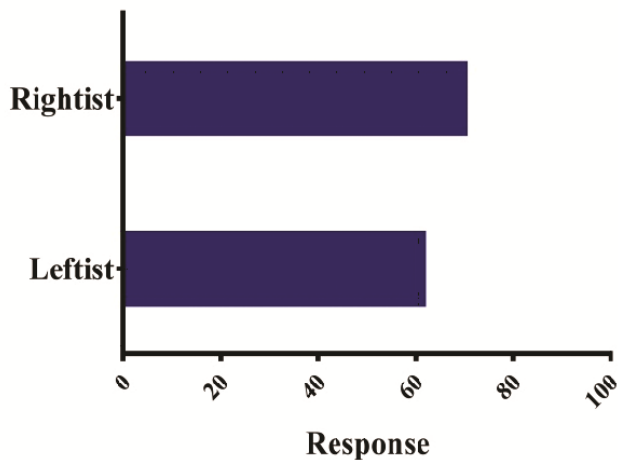
### A. Gender



### B. Religion



### C. Politics



### D. Occupation

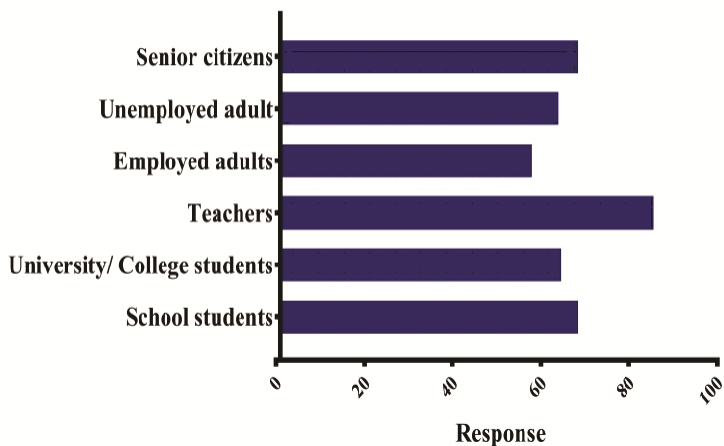
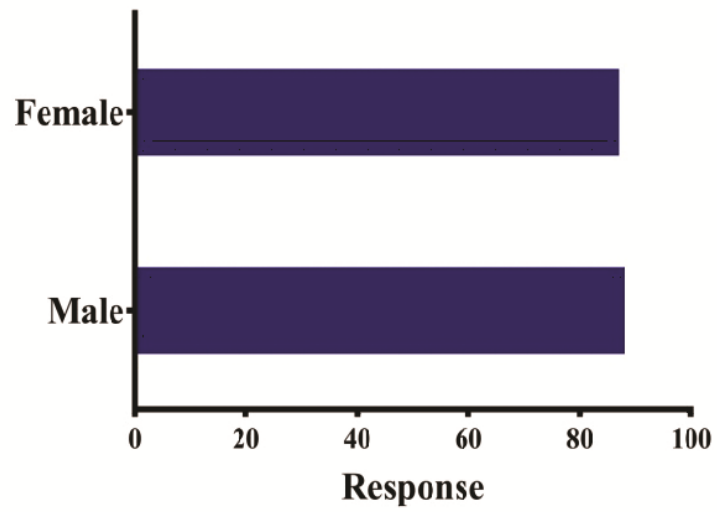


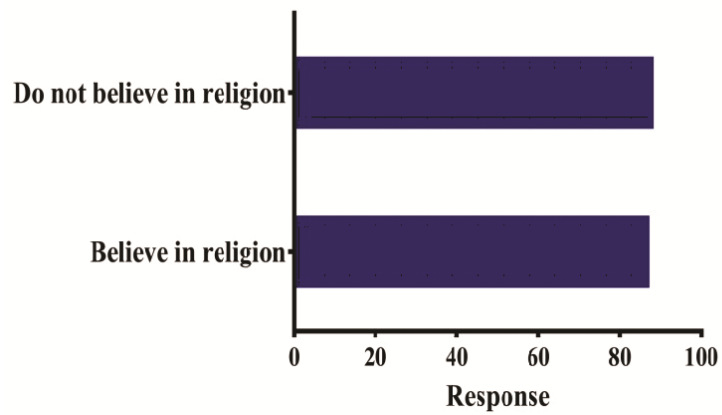
Fig. 2: Public acceptance of evolution, as measured by percentage of respondents who responded “definitely true” for the question “Human beings as we know them developed from earlier species of animals”. Public acceptance grouped by gender, religion, politics and occupation.



### A. Gender



### B. Religion



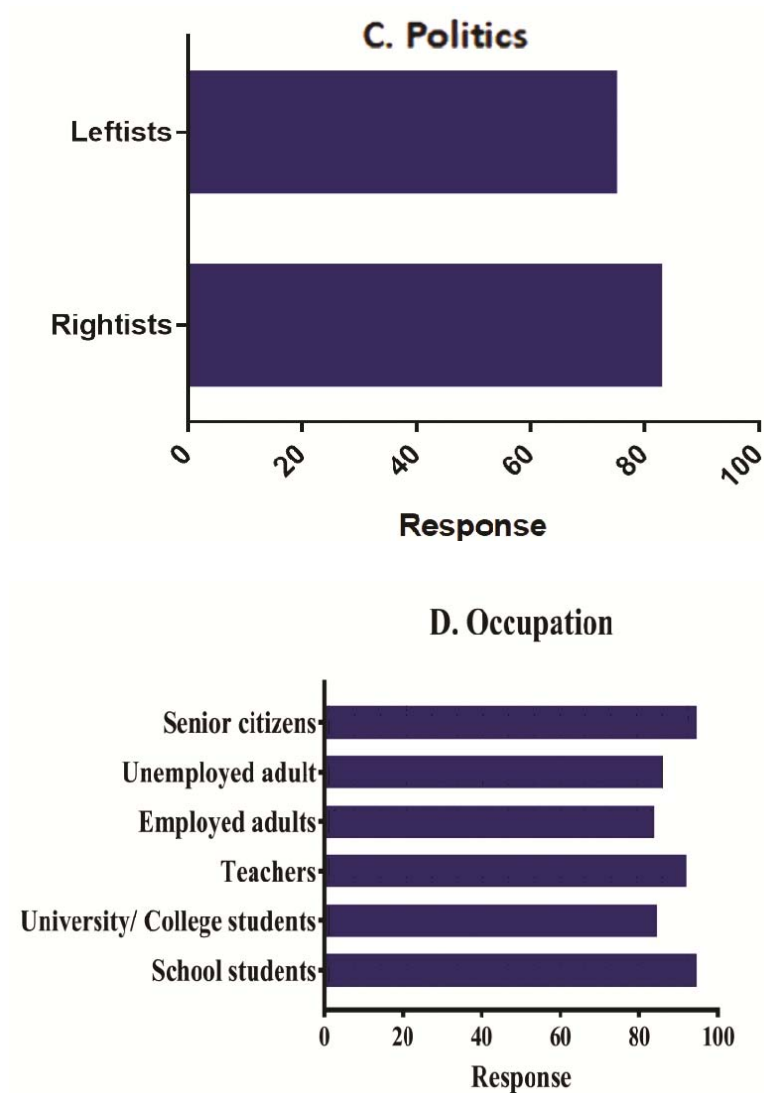


Fig. 3: Public acceptance of evolution, as measured by percentage of respondents who responded 'earth is older than 10,000 years.' Public acceptance grouped by gender, religion, politics and occupation.

Overall, the difference between population who believed in older earth (90%) and those who believed in younger earth (10%) was statistically significant ( $P < 0.0001$ ) at 95% confidence

interval. No statistically significant differences were observed between believers vs. non-believers ( $P=0.80$ ), and leftists vs. rightists ( $P=0.40$ ).

A summary of the responses for the third question (man evolved from other animals) and fourth question (earth is older than 10000 years) is presented in Table 1.

Table 1 — Summary of responses. First three rows summarize responses for the third question, while the next three rows for the fourth question.

	Mean (S.D)	Difference between means $\pm$ S.E	P value for student's t-test	Significantly different? ( $p<0.05$ )
<b>Definitely true</b>	<b>68.5(10.8)</b>	<b>62.96 <math>\pm</math> 3.162</b>	<b>&lt;0.0001</b>	<b>Yes</b>
<b>Vs</b>				
<b>False</b>	<b>5.5(4.6)</b>			
Religious and say definitely true	67(13)	-7.1 $\pm$ 4.5	0.12	No
<b>Vs</b>	74(11)			
Non-religious and say definitely true				
Rightist and say definitely true	65.8(23.5)	5.20 $\pm$ 7.74	0.5080	No
<b>Vs</b>	60.6(17.0)			
Leftist and say definitely true				
<b>Believe in old earth</b>	<b>90(8.1)</b>	<b>80 <math>\pm</math> 3.1</b>	<b>&lt;0.0001</b>	<b>Yes</b>
<b>Vs</b>	<b>10(8.1)</b>			
<b>Believe in new earth</b>				
Religious and believe in old earth	89(7.4)	-0.75 $\pm$ 4.1	0.80	No
<b>Vs</b>	89(13)			
Non-religious and believe in old Earth				

Rightist and say Old EarthVs	83.60(21.4)	7.763 ± 9.129	0.40	No
Leftist and say Old Earth	75.84(26.51)			

### Discussion

The main purpose of the study was to gauge the public acceptance of evolution in India. Variables like state, gender, religion, political ideology and occupation were used to predict attitudes towards evolution. There can be various plausible reasons for the results obtained from the study.

While creation-evolution controversy has been in debate in the United States and other countries as well, prevalence of creation theory (Intelligent Design) is virtually absent in India. In the United States, the biblical literalists reject human evolution from other life forms in favor of Genesis which they view as true and a literal account of creation of human beings by God. For them it supersedes scientific investigation and discoveries. Such has never been the case in India. Darwin's theory of evolution was welcomed and assimilated by the educated in India. In fact, American Hindus have expressed apprehension about attempts to teach Christian creationism in public schools in the U.S.

Possible reasons for both religious and non-religious groups of Indian population accepting evolution as revealed in this survey could be attributed to the fact that the major religion in India is Hinduism (80.3% in 2011 census) (Chandramouli & General, 2011). Hindu texts do not outrightly reject evolution. Most Hindus accept the theory of biological evolution, as similar concepts have existed in India since time immemorial. For example, Hindu concepts of *dashavatara* (ten incarnations of Lord Vishnu) and "cosmic cycle of creation and destruction". British evolutionary biologist J.B.S. Haldane suggested that the Hindu concept of *dashavatara* gave a 'rough' idea of evolution (Dronamraju, 2010). A majority of respondents in this study believed that the Earth is more than 10,000 years old. A probable reason for this could be that the age of the Earth according to Indian texts is 1.97 billion years, which is immensely older than the 6000 years as promulgated by Abrahamic religions (current scientific consensus of age of earth is 4.543 billion years).

In our survey, a majority of both rightists and leftists accepted evolution to be definitely true. The possible reasons for this finding could be that the evolution issue has never been politicized in India in a manner as was seen in the United States. The proportion of rightists agreeing with the old earth was marginally higher than that of leftists, although difference was not significant. This came as a surprise; reason for this disparity could be related to the prevalence of Hinduism among the religions in India and strong agreement of Hindu concepts with the proposition of old earth as explained earlier.

In the second half of the 20<sup>th</sup> century, the conservative wing of the Republican Party of the United States had adopted creationism as a part of a platform designed to consolidate their support in Southern and Midwestern states – the “red” states. No political party in India has used opposition to evolution as a part of its political platform other than a few recent incidents.

With regard to occupational association, the two groups of population most likely to accept evolution were found to be teachers and school students. The probable reason for high acceptance among them could be that they are most likely to be updated and exposed to Darwinism as part of curricular syllabus than other groups. Of course, pseudoscientific ideas like creationism and intelligent design had never been introduced in Indian school textbooks. Educational curriculum in India has always been science-based, without religious allegiances, unlike the United States where in the 1990s, the state Republican platforms in seven states included explicit demands for the teaching of “creation science”. A split regarding whether creationism should be taught in public school was evident in United States of America. Such was never the case in Indian public schools.

This survey can be improved on several lines. As stated previously, subjective, open-ended questions would reveal trends that are more intricate, although it would also increase chances of bias. A correlation with socio-cultural and economic aspects, missing in the present study, could also be attempted in future undertakings. Sample size could be increased and this survey can be extended to other states where the present study did not focus.

**S1. Questionnaire used for the survey on public acceptance of evolution in India**

1. Your particulars:

	(please tick ✓ appropriate)	
<b>Gender</b> →	Male	Female
<b>Belief in Religion</b> →	I believe in religion	I do not believe in religion
<b>Politics</b> →	Left (For e.g., Communist Party, Janata Dal, Congress, etc.)	Right (For e.g., BJP, PDP, SAD, etc.)

2. Which among the following describes you best? (please tick ✓ only one)

School Student	Employed Adult (18+)
College/University Student	Teacher
Unemployed Adult (18+)	Senior Citizen (60+)

3. What do you think about the following statement:  
*“Human beings, as we know them, developed from earlier species of animals”*  
 (please tick ✓ only one)

<b>Definitely True</b>	<input type="checkbox"/>	<b>Definitely False</b>	<input type="checkbox"/>
<b>Probably True</b>	<input type="checkbox"/>	<b>Probably False</b>	<input type="checkbox"/>

4. Which among the following do you believe in? (please tick ✓ only one)

<b>Earth is younger than 10,000 years</b>	<input type="checkbox"/>
<b>Earth is older than 10,000 years</b>	<input type="checkbox"/>

5. What do you think about the following statement:  
*“There is solid evidence of recent global warming due mostly to human activity such as burning fossil fuels.”*  
 (please tick ✓ only one)

<b>Agree</b>	<input type="checkbox"/>
<b>Disagree</b>	<input type="checkbox"/>

6. **Your Name:**

**Thank you for taking part in this survey!**

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