

*Australian Institute of Physics  
Tasmanian Branch*

**A.I.P. SCHOOLS PHYSICS QUIZ - 2004  
ROUND 1 – EINSTEIN’S LIFE**

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

- 1.1.** Einstein’s first name was  
(a) Alfred (b) Aldo (c) Albrecht (d) Algernon (e) Albert (f) Ali.
- 1.2.** Einstein was born in the year  
(a) 1877 (b) 1879 (c) 1880 (d) 1882.
- 1.3.** He was born in  
(a) Munich (b) Heidelberg (c) Ulm (d) Zurich (e) Bern.
- 1.4.** Einstein finished high school in  
(a) Pavia (b) Zurich (c) Munich (d) Aarau (e) Milan.
- 1.5.** What was the name of Einstein’s first wife?  
(a) Else Loewenthal (b) Lisa Meitner (c) Margot Weber (d) Mileva Maric.
- 1.6.** What was Einstein's first job after he completed his degree?
- 1.7.** Einstein was appointed at universities in the following cities:  
(a) Zurich (b) Prague (c) Berlin (d) Princeton (e) all of these.
- 1.8.** Einstein left Germany permanently for the USA in the year  
(a) 1930 (b) 1933 (c) 1935 (d) 1938.
- 1.9.** He was offered the presidency of which country in his old age?
- 1.10.** What musical instrument did Einstein play?

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## ROUND 2

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

- 2.1.** A 80 kg man stands in a lift which is moving up at a constant speed of 5m/s. The force exerted on him by the floor is:  
(a) zero      (b) 80 N      (c) 785 N      (d) 400 N
- 2.2.** It takes Pluto a longer time to travel around the Sun than the Earth does because Pluto  
(a) has farther to go      (b) goes slower      (c) both of these      (d) neither of these.
- 2.3.** The kWh (kilowatt hour) is a unit of:  
(a) power      (b) power/time      (c) energy/time      (d) work.
- 2.4.** If you wish to spear a fish with a regular spear, you should compensate for refraction between the air and water and throw your spear  
(a) directly at the sighted fish  
(b) above the sighted fish round  
(c) below the sighted fish.
- 2.5.** Alcohol is less dense than water. If alcohol is used to make a barometer on a day when atmospheric pressure is normal, the height of the alcohol column would be  
(a) less than 10.3m      (b) more than 10.3m      (c) 10.3 m
- 2.6.** The higher the temperature of an object, the  
(a) shorter the wavelengths it radiates      (b) longer the wavelengths it radiates  
(c) lower the frequencies it radiates      (d) none of these
- 2.7.** Which one of the following will result in standing waves?  
(a) the superposition of waves that travel with different speeds  
(b) the superposition of identical waves that travel in the same direction  
(c) the superposition of identical waves that travel in opposite directions  
(d) the superposition of nearly identical waves of slightly different amplitudes  
(d) the superposition of nearly identical waves of slightly different frequencies
- 2.8.** Most of the energy produced by the Sun is due to  
(a) nuclear fission      (b) nuclear fusion  
(c) chemical reaction      (d) gravitational collapse
- 2.9.** A muon is a particle that exists for 2.2 microseconds when at rest. If moving in laboratory at speed 0.99 c, its lifetime according to laboratory clocks would be  
(a) several times less than 2.2  $\mu$ s  
(b) several times more than 2.2  $\mu$ s  
(c) the same, i.e. 2.2  $\mu$ s

- 2.10.** On May 5 this year we were able to observe in Tasmania the  
(a) transit of Venus across the disc of the Sun      (b) total eclipse of the Sun  
(c) total eclipse of the Moon      (d) meteor shower
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**A.I.P. SCHOOLS PHYSICS QUIZ - 2004**  
**ROUND 3 – EINSTEIN'S SCIENCE**

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

- 3.1.** Einstein's doctoral thesis on the diffusion of molecules in a fluid and his papers on Brownian motion determined which famous number?  
(a) Brown's      (b) Planck's      (c) Avogadro's      (d) Euler's
- 3.2.** In what year did Einstein publish his first two papers on special relativity, Brownian motion and photoelectric effect?
- 3.3.** Einstein's equations for special relativity conform to whose transformation laws between space and time coordinates?  
(a) Pauli      (b) Planck      (c) Wien      (d) Lorentz
- 3.4.** One of the corner stones of the general theory of relativity is the principle of equivalence. The equivalence principle asserts that the effects of accelerated motion are indistinguishable from  
(a) radioactivity      (b) gravity      (c) electromagnetism      (d) nuclear forces
- 3.5.** What experiment conducted in 1919 clinched the general theory of relativity?
- 3.6.** Einstein was particularly fond of "gedanken" experiments. What are they?
- 3.7.** What planet's precession of perihelion is regarded as one of the main tests of the theory of general relativity?
- 3.8.** Einstein was awarded the Nobel Prize for Physics in the year  
(a) 1905      (b) 1916      (c) 1921      (d) 1924.
- 3.9.** He was awarded the prize for  
(a) Explanation of Brownian motion  
(b) Development of the special theory of relativity  
(c) Formulating the theory of general relativity  
(d) Law of the photoelectric effect  
(e) Specific heat of solids

- 3.10. "Optical" astronomers at the University of Tasmania are using the phenomenon predicted by Einstein to enhance detection of distant stars and galaxies. What is the name of the phenomenon?
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**A.I.P. SCHOOLS PHYSICS QUIZ - 2004**  
**ROUND 4**

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

- 4.1. For a system in mechanical equilibrium, the net force on the system  
(a) is zero  
(b) and the net torque on the system are zero  
(c) may be any amount as long as the net torque is zero  
(d) is zero while the net torque may be any amount not equal zero
- 4.2. In a closed bottle are a certain number of hydrogen molecules. In an identical closed bottle at the same temperature and internal pressure are a certain number of oxygen molecules. The bottle with the greater number of molecules is the one containing  
(a) hydrogen      (b) oxygen      (c) both the same
- 4.3. As a pearl fisher holding his breath swims deeper and deeper beneath the water's surface, his density  
(a) increases      (b) decreases      (c) stays the same
- 4.4. Double the frequency of sound and you also double its  
(a) wavelength    (b) speed      (c) amplitude    (d) all of these    (e) none of these
- 4.5. In the diagram below, the current in the  $3\ \Omega$  resistor is 4 A. The potential difference between points M and N is:  
(a) 0.75 V      (b) 1.25 V      (c) 12 V      (d) 20 V
- The diagram shows a circuit with two resistors connected in series between points M and N. The first resistor, closer to point M, is labeled  $3\ \Omega$ . The second resistor, closer to point N, is labeled  $2\ \Omega$ . The current flowing through the  $3\ \Omega$  resistor is given as 4 A.
- 4.6. A wire carrying a current is normally charged  
(a) negatively    (b) positively    (c) not at all
- 4.7. For FM radio the F stands for  
(a) frequency    (b) forced vibration at which resonance occurs  
(c) fouled-up    (d) faze      (e) none of these
- 4.8. One zeptosecond is  
(a)  $10^{-18}$  s      (b)  $10^{-20}$  s      (c)  $10^{-21}$  s      (d)  $10^{-24}$  s
- 4.9. Nuclei of atoms consist of

- (a) neutrinos      (b) photons      (c) quarks      (d) electrons      (e) DNA

**4.10.** On June 8 this year we were observing the transit of Venus across the disc of the Sun. In which year will we have the next opportunity to see Venus eclipsing the Sun?

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**A.I.P. SCHOOLS PHYSICS QUIZ - 2004**  
**ROUND 5 – EINSTEIN'S INFLUENCE**

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

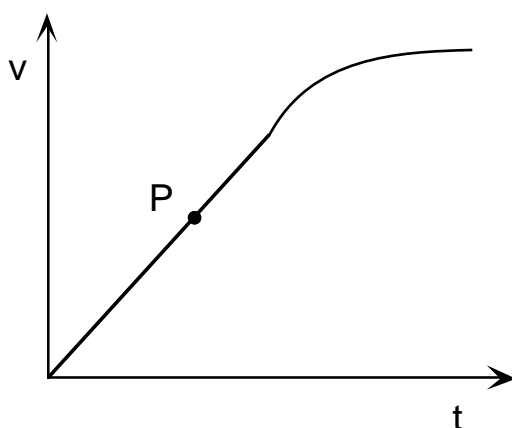
- 5.1.** In his university career Einstein supervised the following number of PhD students  
(a) over 100      (b) 51-100      (c) 1-50      (d) none .
- 5.2.** Karl Schwarzschild was the first person who derived an exact solution to Einstein's new field equation linking space, time and gravity. In particular, he showed that the horizon radius  $R$  of a massive object is related to its mass  $M$  in accordance with the equation  $R=2GM/c^2$ . The massive objects are called  
(a) red dwarfs      (b) white giants      (c) black holes      (d) brown giants.
- 5.3.** What was the name of Einstein's fellow student and friend in Zurich who assisted him in the formulation of general relativity?  
(a) Max Born      (b) Paul Ehrenfest      (c) Marcel Grossmann      (d) Hermann Minkowski
- 5.4.** Name at least two phenomena/features/qualities named after Einstein.
- 5.5.** In 1924 Einstein was reviewing a PhD thesis of one of Paul Langevin's students. The thesis developed from Albert Einstein's work, which showed that light could be explained in terms of particles and proposed that particles could also behave as waves. Einstein comments were "I believe that it involves more than a mere analogy".  
Who was the PhD student?
- 5.6.** Einstein's heroes were  
(a) Planck      (b) Mach      (c) Maxwell      (d) Newton      (e) Lorentz      (f) all of them
- 5.7.** The EPR or Einstein-Podolsky-Rosen paradox concerns the conflict between quantum mechanics and "no faster than light communication". Einstein referred to it as a "*spooky action at*  
(a) a time"      (b) a distance"      (c) infinity"      (d) a locality"
- 5.8.** When a collection of integer spin atoms are cooled to **very** low temperatures (near 0 K) they undergo the phenomenon of \_\_\_\_\_ condensation.

- 5.9. A Hungarian physicist made numerous patent applications with Einstein, mainly on refrigeration. In 1939 with Einstein and Wigner he also drafted a letter to President Roosevelt on the need for action in the development of atomic weapons. Who was he?  
(a) Paul Erdos (b) Edward Teller (c) George Polya (d) Leo Szilard
- 5.10. Einstein was not convinced about statistical interpretation of quantum mechanics and once said “*Gott wuerfelt nicht*” which is translated to  
*God does not play*  
(a) games (b) piano (c) dice (d) cards (e) chess.
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**A.I.P. SCHOOLS PHYSICS QUIZ - 2004**  
**ROUND 6**

**FIND THE MOST APPLICABLE ANSWER IF THE QUESTION IS MULTIPLE CHOICE**

- 6.1. An object moves in a circle. If the radius is doubled keeping the speed the same then the centripetal force is:  
(a) twice as great (b) half as great (c) four times as great (d) the same
- 6.2. It takes 6 seconds for a stone to fall from the rest to the bottom of a mine shaft. How deep is the shaft?  
(a) about 60 m (b) about 120 m (c) about 180 m (d) more than 200 m
- 6.3. The diagram shows a velocity-time graph for a car moving in a straight line. At point **P** the car must be:  
(a) moving with zero acceleration  
(b) climbing a hill  
(c) accelerating  
(d) stationary  
(e) moving at about 45 degrees with respect to the x-axis.



- 6.4. Ice cubes submerged at the bottom of a liquid mixture indicate that the mixture  
(a) fails to produce a net buoyant force on the ice (b) has dissolved air in a liquid state  
(c) is not displaced by the submerged ice (d) is less dense than ice

- 6.5.** Polarisation is a property of  
(a) transverse waves      (b) longitudinal waves      (c) both      (d) neither
- 6.6.** Two charged particles held close to each other are released. As they move, the force on each particle increases. Therefore the particles have  
(a) the same sign      (b) the opposite sign      (c) not enough information given
- 6.7.** The force on an electron moving in a magnetic field will be the largest when its direction is  
(a) the same as the magnetic field direction  
(b) exactly opposite to the magnetic field direction  
(c) perpendicular to the magnetic field direction  
(d) at an angle other than 90 degrees to the magnetic field direction  
(e) none of these
- 6.8.** In a photoelectric effect experiment electrons ejected from bound states in the photosensitive material have  
(a) less kinetic energy than the absorbed photon's energy  
(b) more kinetic energy than the absorbed photon's energy  
(c) kinetic energy equal to the absorbed photon's energy
- 6.9.** An alpha particle is  
(a) a helium nucleus      (b) a hydrogen nucleus  
(c) an electron      (d) a radioactive element
- 6.10.** 2003 Nobel Prize in Physics was awarded to Alexei. A. Abrikosov, Vitaly L. Ginzburg and Anthony Leggett "for pioneering contributions to the theory of super..... and superfluidity".