UNIT 24 RELATIVITY

MUTIPLE CHOICE QUESTIONS (BOOK)

1. The General Theory of Relativity was a new way of understanding of
   (a) The speed of light **(b) gravity**
   (c) mass (d) force
2. An object at rest has a mass of 1 kg. What is its mass when it is moving at a speed of 0.9c?
   (a) Infinite (b) 1.2 kg
   (c) 2.3 kg (d) 1 kg
3. The equivalence of principle in general relativity is:
   (a) The equivalence of inertial and gravitational mass
   (b) The equivalence of electric and magnetic fields
   (c) The equivalence of space and time
   (d) The equivalence of matter and energy
4. Which of the following phenomena is NOT predicted by special relativity?
   (a) Time dilation (b) Length contraction
   (c) Gravitational waves (d) Relativistic mass increase
5. What does the equivalence principle state about acceleration and gravity?
   (a) They are completely different forces
   (b) They are indistinguishable for an observer
   (c) Gravity is stronger than acceleration
   (d) Acceleration cancels out gravity
6. Light passing near a massive object like a star will bend due to:
   (a) Gravitational lensing (b) refraction
   (c) reflection (d) diffraction
7. What is the main reason astronomers cannot directly observe black holes?
   (a) They are too small (b) They deflect light
   (c) They are too far away **(d) their immense gravity traps light**
8. Objects cannot exceed the speed of light because:
   (a) Their mass becomes infinite (b) Their length becomes zero
   (c) Time slows down to zero (d) they lose all energy
9. Why is the Galilean transformation not valid at high speeds?
   (a) It cannot handle accelerating frames
   (b) It violates the constancy of the speed of light
   (c) It only works in flat spacetime
   (d) It neglects time dilation effects
10. The example of inertial frame in our everyday life is:
    (a) A car accelerating on a highway
    (b) A train moving smoothly at constant speed
    (c) A person standing on a spinning platform
    (d) an airplane encountering turbulence

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EXAM PRACTICE MUTIPLE CHOICE QUESTIONS

1 1.In general Lorenz transformation the time coordinate is:
(a)Relative **(b) absolute**
(c) not defined (d) none of these

2. Maxwell's equation is invariant under _____ transformation.
(a) Lorenz (b) General Galilean
(c) Special Galilean (d) none of these

3 A frame in rotational motion relative to an inertial frame is
(a)An inertial frame **(b)A non-inertial frame**
(c)A special frame (d)Not a frame

4 In General Galilean transformations space coordinates are:
(a) Relative (b) absolute
(c) not defined (d) none of these

5. Newton's equations of motions are invariants under _____ transformation.
(a) General Lorenz (b) special Lorenz
(c) Special Galilean (d) none of these

6 According to the theory of relativity, which of the following always remains constant
(a) Length of an object (b) Time
(c) Space **(d) Velocity of light**

7 A frame of reference is called inertial if it is:
(a) accelerated (b) rotatory
(c) vibratory **(d) moving with uniform velocity**

8 A consequence of Einstein's theory of relativity is:
(a) moving clocks run more slowly than when they are at rest
(b) moving rods are longer than when they are at rest
(c) light has wave properties
(d) the laws of physics do not same to all observers moving with uniform velocity relative to each other

9 A consequence of Einstein's theory of relativity is:
(a) moving clocks run faster than when they are at rest
(b) moving rods are shorter than when they are at rest
(c) light has both wave and particle properties
(d) everything is absolute rest and absolute motion

10 If the sun radiates energy at the rate of 4×10^{26} Js^{-1}, what is the rate at which its mass is decreasing?
(a) 5.54×10^{9} kgs^{-1} **(b) 4.44×10^{9} kgs^{-1}**
(c) 3.44×10^{9} kgs^{-1} (d) 2.44×10^{9} kgs^{-1}

11 For Einstein's relation, $E^2 - p^2c^2 =$ _____
(a) m_oc^2 **(b) $m_o^2c^4$**
(c) m_oc^4 (d) $m_o^2c^6$

12 A frame of reference has four coordinates, x, y, z, and t is referred to as the …….
(a) Inertial frame of reference
(b) Non-inertial frame of reference
(c) Space-time reference
(d) five-dimensional plane

13 A man, who weighs 60 kg on earth, weighs 61 kg on a rocket, as measured by an observer on earth. What is the speed of the rocket?
(a) 2.5×10^8 m/s
(b) 2.5×10^7 m/s
(c) 5.5×10^7 m/s
(d) 5.5×10^8 m/s

14 The length of a rod seems shorter to an observer when it moves in a specific direction. What change would he observe when the direction of rod changes by 180o?
(a) The rod becomes even smaller
(b) The length of the rod increases
(c) The length of the rod remains the same
(d) The rod has the length equal to its proper length

15 How fast does a rocket have to move relative to an observer for its length to be contracted to 95% of its original length?
(a) 0.5 c
(b) 0.4 c
(c) 0.3 c
(d) 0.2 c

16 A particle with a lifetime of 2×10^{-6} s moves through the laboratory with a speed of 0.9 c. It's lifetime, as measured by an observer in the laboratory, is:
(a) 2×10^{-6} s
(b) 3.2×10^{-6} s
(c) 5.6×10^{-6} s
(d) 4.6×10^{-6} s

17 The theory of special relativity
(a) Is based on a complex mathematical analysis.
(b) Has not been verified by experiment.
(c) Does not agree with Newtonian mechanics.
(d) Does not agree with electromagnetic theory.

18 One of Einstein's postulates in formulating the special theory of relativity was that the laws of physics are the same in reference frames that
(a) Accelerate.
(b) Move at constant velocity with respect to an inertial frame.
(c) Oscillate.
(d) Are stationary, but not in moving frames.

19 Relative to a stationary observer, a clock moving (v = 0.8 c) in a space ship will be
(a) Always runs slower than normal.
(b) Always runs faster than normal.
(c) Keeps its normal time.
(d) Can do any of the above. It depends on the relative velocity between the observer and the clock.

20 An object moves in a direction parallel to its length with a velocity near to the velocity of light. The width of this object, as measured by a stationary observer,
(a) Approaches infinity.
(b) Approaches zero.
(c) Increases slightly.
(d) Does not change