



EMIRATES AIRLINE PILOT APTITUDE TEST

PHYSICS & SCIENCE — PRACTICE PAPER (Model A)

COMPASS System | 50 Questions | Time Allowed: 40 Minutes | No Calculator Permitted

INSTRUCTIONS

- This paper contains 50 questions across 10 physics and science topics tested in the Emirates Airline COMPASS pilot aptitude assessment.
- Select the one best answer from the four options (A, B, C, D) for each question.
- No calculator is permitted. All calculations must be performed mentally or on rough paper.
- Time allowed is 40 minutes. Aim to spend no more than 48 seconds per question.
- Attempt all questions. There is no negative marking.
- A full Answer Key with Explanations is provided at the end of this paper.

SECTION 1: Mechanics & Newton's Laws



Q1. Which of Newton's laws is also known as the Law of Inertia?

- A) First Law
- B) Second Law
- C) Third Law
- D) Universal Law

Q2. An aircraft of mass 60,000 kg accelerates at 2.5 m/s^2 . What is the net force acting on it?

- A) 120,000 N
- B) 150,000 N
- C) 180,000 N
- D) 240,000 N

Q3. What is the SI unit of power?

- A) Joule
- B) Watt
- C) Newton
- D) Pascal

Q4. Which force opposes the forward motion of an aircraft?

- A) Lift
- B) Thrust
- C) Weight
- D) Drag

Q5. If an object is moving at a constant velocity, the net force is:

- A) Maximum
- B) Increasing
- C) Zero
- D) Equal to its mass

SECTION 2: Work, Energy & Power

Q6. What type of energy does an aircraft possess due to its altitude?

- A) Kinetic Energy
- B) Potential Energy
- C) Thermal Energy
- D) Chemical Energy

Q7. Calculate the work done when a force of 500 N moves an object 10 meters.

- A) 50 J
- B) 500 J
- C) 5,000 J
- D) 50,000 J



Q8. Power is defined as:

- A) Force * Distance
- B) Mass * Acceleration
- C) Work / Time
- D) Energy * Time

Q9. If the velocity of an aircraft is doubled, its kinetic energy will:

- A) Double
- B) Halve
- C) Quadruple
- D) Stay same

Q10. The First Law of Thermodynamics is a statement of:

- A) Conservation of mass
- B) Conservation of energy
- C) Conservation of momentum
- D) Entropy

SECTION 3: Fluid Dynamics & Aerodynamics

Q11. According to Bernoulli's principle, as fluid velocity increases, pressure:

- A) Increases
- B) Decreases
- C) Remains constant
- D) Fluctuates

Q12. The shape of a wing designed to generate lift is called an:

- A) Airfoil
- B) Empennage
- C) Fuselage
- D) Aileron

Q13. What happens to atmospheric pressure as altitude increases?

- A) Increases
- B) Decreases
- C) Stays same
- D) Doubles

Q14. Which type of drag is NOT aerodynamic?

- A) Parasite drag
- B) Induced drag
- C) Magnetic drag
- D) Wave drag

Q15. Archimedes' principle explains:

- A) Lift
- B) Buoyancy
- C) Thrust
- D) Friction



SECTION 4: Gas Laws & Thermodynamics

Q16. Boyle's Law relates:

- A) Pressure and Temperature
- B) Pressure and Volume
- C) Volume and Temperature
- D) Density and Mass

Q17. Charles's Law states that at constant pressure, volume is proportional to:

- A) Density
- B) Mass
- C) Absolute Temperature
- D) Velocity

Q18. Dalton's Law relates to:

- A) Partial pressures
- B) Total mass
- C) Gas velocity
- D) Refraction

Q19. Heat transfer through solids is called:

- A) Convection
- B) Radiation
- C) Conduction
- D) Insulation

Q20. Absolute zero is equivalent to:

- A) 0°C
- B) -100°C
- C) -273.15°C
- D) -459.67°C

SECTION 5: Electricity & Magnetism

Q21. Ohm's Law formula is:

- A) $V = I / R$
- B) $V = I * R$
- C) $P = V * I$
- D) $R = V * I$

Q22. In a parallel circuit, if one component fails:

- A) All fail
- B) Voltage increases
- C) Others continue to work
- D) Resistance is zero

Q23. The unit of electrical resistance is:

- A) Ampere
- B) Volt
- C) Ohm
- D) Watt



Q24. A device converting mechanical to electrical energy is a:

- A) Motor
- B) Generator
- C) Transformer
- D) Battery

Q25. The magnetic compass points to:

- A) True North
- B) Magnetic North
- C) Grid North
- D) South

SECTION 6: Waves, Sound & Optics

Q26. Sound travels fastest in:

- A) Air
- B) Water
- C) Steel
- D) Vacuum

Q27. The Doppler Effect refers to a change in:

- A) Speed
- B) Frequency
- C) Amplitude
- D) Polarization

Q28. Which EM wave has the longest wavelength?

- A) Gamma
- B) X-ray
- C) Radio
- D) UV

Q29. Bending of light as it changes mediums is:

- A) Reflection
- B) Refraction
- C) Diffraction
- D) Dispersion

Q30. Speed of light in vacuum is approx:

- A) 300,000 km/s
- B) 340 m/s
- C) 1,000,000 km/s
- D) 150,000 km/s



SECTION 7: Mechanics & Circular Motion

Q31. The force directed towards the center of a circle is:

- A) Centrifugal
- B) Centripetal
- C) Gravity
- D) Friction

Q32. Momentum is defined as:

- A) $m * v$
- * a
- C) $F * t$
- D) W / t

Q33. In an elastic collision:

- A) Only momentum is conserved
- B) Only KE is conserved
- C) Both are conserved
- D) Neither is conserved

Q34. Torque is a measure of:

- A) Linear force
- B) Rotational force
- C) Acceleration
- D) Inertia

Q35. Resistance to change in state of motion is:

- A) Gravity
- B) Friction
- C) Inertia
- D) Weight

SECTION 8: Properties of Matter

Q36. Density is:

- A) $m \cdot V$
- B) W / V
- C) m / V
- D) V / m

Q37. Hooke's Law relates to:

- A) Pressure
- B) Electricity
- C) Elasticity
- D) Gases

Q38. Pascal's principle states pressure in fluid is:

- A) Lost
- B) Transmitted equally
- C) Converted to heat
- D) Variable

Q39. Liquid turning to gas is:

- A) Melting
- B) Freezing
- C) Boiling
- D) Dew point

Q40. Definite volume but no definite shape is:

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

SECTION 9: Aviation Science Applications

Q41. Why do high-altitude runways require longer takeoffs?

- A) More gravity
- B) Lower air density
- C) Shorter runways
- D) High temp

Q42. Pitot-static system measures:

- A) Engine temp
- B) Dynamic/Static pressure
- C) Fuel flow
- D) Voltage

Q43. Primary purpose of flaps is:

- A) Steering
- B) Increase lift/drag at low speed
- C) Fuel efficiency
- D) Engine stop

Q44. Jet engine compressor:

- A) Ignites fuel
- B) Increases air pressure
- C) Mixes fuel/air
- D) Extracts energy

Q45. Mach number is ratio of speed to:

- A) Light
- B) Sound
- C) Stall
- D) Wind



SECTION 10: General Science & Calculations

Q46. 12V battery, 4 Ohm resistor. Current?

- A) 2 A
- B) 3 A
- C) 4 A
- D) 48 A

Q47. Lever: 100N at 2m. Effort at 4m?

- A) 25 N
- B) 50 N
- C) 100 N
- D) 200 N

Q48. MA of system lifting 600N with 150N effort?

- A) 2
- B) 3
- C) 4
- D) 5

Q49. Free fall velocity after 3s ($g=9.8$)?

- A) 9.8
- B) 19.6
- C) 29.4
- D) 44.1

Q50. Hydraulic: 10cm^2 to 100cm^2 . 50N input. Output?

- A) 5 N
- B) 50 N
- C) 500 N
- D) 5,000 N



ANSWER KEY & EXPLANATIONS

Q1. ✓ Correct Answer: A) First Law

Explanation: Inertia is the resistance of an object to any change in its motion.

Q2. ✓ Correct Answer: B) 150,000 N

Explanation: $F = m \cdot a = 60,000 \cdot 2.5 = 150,000 \text{ N}$.

Q3. ✓ Correct Answer: B) Watt

Explanation: Watt (W) is the unit of power, defined as one joule per second.

Q4. ✓ Correct Answer: D) Drag

Explanation: Drag is the aerodynamic force that opposes the motion of an object through a fluid.

Q5. ✓ Correct Answer: C) Zero

Explanation: Constant velocity means zero acceleration, which implies zero net force according to $F=ma$.

Q6. ✓ Correct Answer: B) Potential Energy

Explanation: Gravitational potential energy depends on the height above a reference point.

Q7. ✓ Correct Answer: C) 5,000 J

Explanation: $\text{Work} = \text{Force} \cdot \text{Distance} = 500 \cdot 10 = 5,000 \text{ Joules}$.

Q8. ✓ Correct Answer: C) Work / Time

Explanation: Power is the rate at which work is performed.

Q9. ✓ Correct Answer: C) Quadruple

Explanation: $KE = \frac{1}{2} \cdot m \cdot v^2$. Doubling v results in $(2v)^2 = 4v^2$.

Q10. ✓ Correct Answer: B) Conservation of energy

Explanation: Energy cannot be created or destroyed, only transformed.

Q11. ✓ Correct Answer: B) Decreases

Explanation: The principle states that an increase in fluid speed occurs simultaneously with a decrease in pressure.

Q12. ✓ Correct Answer: A) Airfoil

Explanation: An airfoil is a cross-sectional shape designed to produce lift efficiently.

Q13. ✓ Correct Answer: B) Decreases

Explanation: Pressure decreases because there is less air above pushing down.

Q14. ✓ Correct Answer: C) Magnetic drag

Explanation: Magnetic drag is not related to the flow of air over the aircraft surface.



Q15. ✓ Correct Answer: B) Buoyancy

Explanation: It states that the buoyant force equals the weight of the fluid displaced.

Q16. ✓ Correct Answer: B) Pressure and Volume

Explanation: At constant temperature, $P * V = \text{constant}$.

Q17. ✓ Correct Answer: C) Absolute Temperature

Explanation: $V / T = \text{constant}$ for a fixed mass of gas at constant pressure.

Q18. ✓ Correct Answer: A) Partial pressures

Explanation: Total pressure of a mixture is the sum of partial pressures of individual gases.

Q19. ✓ Correct Answer: C) Conduction

Explanation: Conduction is the transfer of heat by direct molecular contact.

Q20. ✓ Correct Answer: C) -273.15°C

Explanation: 0 Kelvin is -273.15°C .

Q21. ✓ Correct Answer: B) $V = I * R$

Explanation: Voltage equals current multiplied by resistance.

Q22. ✓ Correct Answer: C) Others continue to work

Explanation: Parallel circuits provide independent paths for current.

Q23. ✓ Correct Answer: C) Ohm

Explanation: Resistance is measured in Ohms (Ω).

Q24. ✓ Correct Answer: B) Generator

Explanation: Generators produce electricity from rotation/motion.

Q25. ✓ Correct Answer: B) Magnetic North

Explanation: Compasses align with the Earth's magnetic field lines.

Q26. ✓ Correct Answer: C) Steel

Explanation: Sound speed increases with the density and elasticity of the medium.

Q27. ✓ Correct Answer: B) Frequency

Explanation: It is the change in frequency due to relative motion between source and observer.

Q28. ✓ Correct Answer: C) Radio

Explanation: Radio waves have the lowest frequency and longest wavelength.

Q29. ✓ Correct Answer: B) Refraction

Explanation: Refraction occurs due to the change in speed of light in different densities.

Q30. ✓ Correct Answer: A) 300,000 km/s

Explanation: The speed of light is roughly $3 * 10^8$ m/s.

Q31. ✓ Correct Answer: B) Centripetal

Explanation: Centripetal means 'center-seeking'.

Q32. ✓ Correct Answer: A) $m \cdot v$

Explanation: Momentum is the product of mass and velocity.

Q33. ✓ Correct Answer: C) Both are conserved

Explanation: Elastic collisions preserve both total momentum and total kinetic energy.

Q34. ✓ Correct Answer: B) Rotational force

Explanation: Torque is the tendency of a force to rotate an object about an axis.

Q35. ✓ Correct Answer: C) Inertia

Explanation: Inertia is the property of matter by which it continues in its existing state.

Q36. ✓ Correct Answer: C) m / V

Explanation: Density is mass per unit volume.

Q37. ✓ Correct Answer: C) Elasticity

Explanation: It states that force is proportional to the extension of a spring.

Q38. ✓ Correct Answer: B) Transmitted equally

Explanation: Pressure applied to an enclosed fluid is transmitted undiminished in all directions.

Q39. ✓ Correct Answer: C) Boiling

Explanation: Boiling occurs at a specific temperature for a given pressure.

Q40. ✓ Correct Answer: B) Liquid

Explanation: Liquids flow and take the shape of their container but maintain volume.

Q41. ✓ Correct Answer: B) Lower air density

Explanation: Less dense air provides less lift and less engine thrust.

Q42. ✓ Correct Answer: B) Dynamic/Static pressure

Explanation: These pressures are used to determine airspeed and altitude.

Q43. ✓ Correct Answer: B) Increase lift/drag at low speed

Explanation: Flaps allow the aircraft to fly slower for takeoff and landing.

Q44. ✓ Correct Answer: B) Increases air pressure

Explanation: It compresses air before it enters the combustion chamber.

Q45. ✓ Correct Answer: B) Sound

Explanation: $Mach = Velocity / Speed\ of\ Sound$.

Q46. ✓ Correct Answer: B) 3 A

Explanation: $I = V / R = 12 / 4 = 3\ A$.

Q47. ✓ Correct Answer: B) 50 N

Explanation: $100 * 2 = \text{Effort} * 4$; Effort = 50 N.

Q48. ✓ Correct Answer: C) 4

Explanation: $MA = \text{Load} / \text{Effort} = 600 / 150 = 4$.

Q49. ✓ Correct Answer: C) 29.4

Explanation: $v = g * t = 9.8 * 3 = 29.4 \text{ m/s}$.

Q50. ✓ Correct Answer: C) 500 N

Explanation: Force ratio = Area ratio. $50 * (100/10) = 500 \text{ N}$.



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