

✈ ETIHAD AIRWAYS PILOT APTITUDE TEST

0553230300

PHYSICS & SCIENCE — PRACTICE PAPER

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

INSTRUCTIONS

- 1. This paper contains 50 questions across 10 physics and science topics tested in the Etihad Airways COMPASS pilot aptitude assessment.
- 2. Select the one best answer from the four options (A, B, C, D) for each question.
- 3. No calculator is permitted. All calculations must be performed mentally or on rough paper.
- 4. Time allowed is 40 minutes. Aim to spend no more than 48 seconds per question.

SECTION 1: Mechanics & Newton's Laws

Q1. While analysing a weather-observation report, In a weather observation scenario, Which of Newton's laws explains why a passenger moves forward when an aircraft stops suddenly?

- A) Third Law
- B) Second Law
- C) First Law
- D) Law of Gravitation

Q2. While analysing a weather-observation report, In a weather observation scenario, An aircraft of mass 60,000 kg accelerates at 4.0 m/s^2 . What is its net force?

- A) 240,000 N
- B) 120,000 N
- C) 200,000 N
- D) 80,000 N

Q3. While analysing a weather-observation report, In a weather observation scenario, A 10 kg load experiences a net force of 50 N. Find its acceleration.

- A) 5.0 m/s^2
- B) 2.0 m/s^2
- C) 8.0 m/s^2
- D) 5.0 m/s^2

العلم نور، والجهل ظلام.

Q4. While analysing a weather-observation report, In a weather observation scenario, Which force acts opposite to the relative motion between an aircraft tyre and the runway?

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

0553220300

Q5. While analysing a weather-observation report, In a weather observation scenario, An object moves at constant velocity. Its resultant force is:

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

SECTION 2: Work, Energy & Power

Q6. While analysing a weather-observation report, In a weather observation scenario, A force of 500 N moves a crate 12 m in its direction. Work done?

- A) 4,800 J
- B) 1,200 J
- C) 6,000 J
- D) 2,400 J

Q7. While analysing a weather-observation report, In a weather observation scenario, What energy does an aircraft possess because of its height above the runway?

- A) Sound energy
- B) Gravitational potential energy
- C) Electrical energy
- D) Kinetic energy

Q8. While analysing a weather-observation report, In a weather observation scenario, A 6 kg object moves at 9 m/s. Its kinetic energy is:

- A) 100 J
- B) 243.0 J
- C) 50 J
- D) 25 J

كل سؤال علمي يقود إلى فهم أعمق.

Q9. While analysing a weather-observation report, In a weather observation scenario, An engine performs 28,000 J of work in 14 s. Its average power is:

- A) 4,000 W
- B) 1,000 W
- C) 2000 W
- D) 2,000 W

0553220300

Q10. While analysing a weather-observation report, In a weather observation scenario, If an aircraft's speed triples, its kinetic energy becomes:

- A) Three times greater
- B) Nine times greater
- C) One-third as large
- D) Unchanged

SECTION 3: Fluid Dynamics & Aerodynamics

Q11. While analysing a weather-observation report, In a weather observation scenario, According to Bernoulli's principle, when airflow speed over a wing increases, pressure generally:

- A) Becomes zero
- B) Remains identical
- C) Decreases
- D) Increases

Q12. While analysing a weather-observation report, In a weather observation scenario, Air flowing through a narrower part of a tube has a speed that is generally:

- A) Unrelated to area
- B) Zero
- C) Lower
- D) Higher

Q13. While analysing a weather-observation report, In a weather observation scenario, The cross-sectional shape designed to generate lift is called a(n):

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

بالعلم يتحول الطموح إلى إنجاز.

Q14. While analysing a weather-observation report, In a weather observation scenario, Induced drag is most significant when an aircraft is flying at:

- A) Taxiing with no lift
- B) High speed and low lift
- C) Zero angle of attack
- D) Low speed and high lift

0553220300

Q15. While analysing a weather-observation report, In a weather observation scenario, Archimedes' principle is used to explain:

- A) Electrical resistance
- B) Magnetic flux
- C) Thermal expansion
- D) Buoyant force

SECTION 4: Gas Laws & Thermodynamics

Q16. While analysing a weather-observation report, In a weather observation scenario, Boyle's law relates pressure and volume when temperature is:

- A) Zero
- B) Constant
- C) Unknown
- D) Increasing

Q17. While analysing a weather-observation report, In a weather observation scenario, At constant pressure, the volume of a gas is proportional to its:

- A) Colour
- B) Absolute temperature
- C) Mass only
- D) Altitude only

Q18. While analysing a weather-observation report, In a weather observation scenario, An ideal gas at 340 K is heated to 680 K at constant pressure. Its volume will:

- A) Stay fixed
- B) Become zero
- C) Halve
- D) Double

التعلم المستمر يصنع نجاح المستقبل.

Q19. While analysing a weather-observation report, In a weather observation scenario, Heat transfer through direct contact in a solid is called:

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

0553220300

Q20. While analysing a weather-observation report, In a weather observation scenario, Absolute zero is approximately:

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

SECTION 5: Electricity & Magnetism

Q21. While analysing a weather-observation report, In a weather observation scenario, A 20 V battery is connected to a 7 Ω resistor. Current?

- A) 6.00 A
- B) 2.86 A
- C) 1.00 A
- D) 3.00 A

Q22. While analysing a weather-observation report, In a weather observation scenario, Two resistors of 8 Ω and 10 Ω are connected in series. Total resistance?

- A) 24 Ω
- B) 4 Ω
- C) 18 Ω
- D) 2 Ω

Q23. While analysing a weather-observation report, In a weather observation scenario, The SI unit of electric charge is:

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

AURA

المعرفة قوة، والمثابرة طريقها.

Q24. While analysing a weather-observation report, In a weather observation scenario, A device that converts mechanical energy into electrical energy is a:

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

0553220300

Q25. While analysing a weather-observation report, In a weather observation scenario, In a parallel circuit, if one branch opens, the other branches generally:

- A) Continue to operate
- B) All stop
- C) Have zero voltage
- D) Become insulators

SECTION 6: Waves, Sound & Optics

Q26. While analysing a weather-observation report, In a weather observation scenario, The unit of frequency is:

- A) Metre
- B) Joule
- C) Newton
- D) Hertz

Q27. While analysing a weather-observation report, In a weather observation scenario, An echo is produced mainly by:

- A) Absorption of sound
- B) Reflection of sound
- C) Diffraction of heat
- D) Refraction of light

Q28. While analysing a weather-observation report, In a weather observation scenario, Which electromagnetic wave has the longest wavelength?

- A) Ultraviolet
- B) X-ray
- C) Radio wave
- D) Gamma ray

العلم نور، والجهل ظلام.

Q29. While analysing a weather-observation report, In a weather observation scenario, Light changes direction when entering a different medium. This is:

- A) Refraction
- B) Polarisation
- C) Resonance
- D) Reflection

0553220300

Q30. While analysing a weather-observation report, In a weather observation scenario, The speed of light in vacuum is approximately:

- A) 3.00×10^8 m/s
- B) 9.80 m/s^2
- C) 3.40×10^2 m/s
- D) 3.00×10^5 m/s

SECTION 7: Mechanics & Circular Motion

Q31. While analysing a weather-observation report, In a weather observation scenario, The force directed toward the centre of circular motion is:

- A) Centripetal force
- B) Weight only
- C) Centrifugal force
- D) Friction only

Q32. While analysing a weather-observation report, In a weather observation scenario, A 9 kg object moving at 8 m/s has momentum:

- A) 20 kg·m/s
- B) 9 kg·m/s
- C) 72 kg·m/s
- D) 40 kg·m/s

Q33. While analysing a weather-observation report, In a weather observation scenario, An impulse equals force multiplied by:

- A) Time interval
- B) Temperature
- C) Distance
- D) Mass

كل سؤال علمي يقود إلى فهم أعمق.

Q34. While analysing a weather-observation report, In a weather observation scenario, For a given mass, doubling angular speed makes rotational kinetic energy:

- A) Unchanged
- B) Half as large
- C) Four times greater
- D) Twice greater

0553220300

Q35. While analysing a weather-observation report, In a weather observation scenario, Torque is calculated as force multiplied by perpendicular:

- A) Temperature
- B) Density
- C) Mass
- D) Distance from the pivot

SECTION 8: Properties of Matter

Q36. While analysing a weather-observation report, In a weather observation scenario, Density is defined as:

- A) Mass ÷ volume
- B) Volume ÷ mass
- C) Mass × volume
- D) Force ÷ area

Q37. While analysing a weather-observation report, In a weather observation scenario, Hooke's law applies within the elastic limit and relates force to:

- A) Extension
- B) Temperature only
- C) Pressure only
- D) Frequency only

Q38. While analysing a weather-observation report, In a weather observation scenario, Pressure in a fluid is transmitted equally in all directions according to:

- A) Ohm's law
- B) Doppler effect
- C) Newton's first law
- D) Pascal's principle

بالعلم يتحول الطموح إلى إنجاز.

Q39. While analysing a weather-observation report, In a weather observation scenario, A liquid changing into a gas at its surface is called:

- A) Sublimation
- B) Freezing
- C) Condensation
- D) Evaporation

0553220300

Q40. While analysing a weather-observation report, In a weather observation scenario, A material with a fixed volume but no fixed shape is a:

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

SECTION 9: Aviation Science Applications

Q41. While analysing a weather-observation report, In a weather observation scenario, At high altitude, air density is generally:

- A) Higher
- B) Unchanged everywhere
- C) Infinite
- D) Lower

Q42. While analysing a weather-observation report, In a weather observation scenario, A pitot-static system is used to sense:

- A) Fuel temperature
- B) Static and dynamic pressure
- C) Battery charge
- D) Oil colour

Q43. While analysing a weather-observation report, In a weather observation scenario, The primary effect of extending flaps during approach is to increase:

- A) Only engine thrust
- B) Electrical resistance
- C) Only altitude
- D) Lift and drag

التعلم المستمر يصنع نجاح المستقبل.

Q44. While analysing a weather-observation report, In a weather observation scenario, Mach number is the ratio of aircraft speed to the local speed of:

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

0553220300

Q45. While analysing a weather-observation report, In a weather observation scenario, A stall occurs when the wing exceeds its critical:

- A) Fuel pressure
- B) Aspect ratio
- C) Engine temperature
- D) Angle of attack

SECTION 10: General Science & Calculations

Q46. While analysing a weather-observation report, In a weather observation scenario, A 27 V circuit carries 4.0 A. Electrical power?

- A) 108.0 W
- B) 10 W
- C) 20 W
- D) 60 W

Q47. While analysing a weather-observation report, In a weather observation scenario, A lever lifts 600 N using an effort of 140 N. Mechanical advantage?

- A) 3.00
- B) 5.00
- C) 4.29
- D) 2.00

Q48. While analysing a weather-observation report, In a weather observation scenario, An object falls from rest for 4.0 s. Using $g = 9.8 \text{ m/s}^2$, final speed is approximately:

- A) 29.4 m/s
- B) 19.6 m/s
- C) 39.2 m/s
- D) 9.8 m/s

AURA

المعرفة قوة، والمثابرة طريقها.

Q49. While analysing a weather-observation report, In a weather observation scenario, A force of 120 N acts over an area of 8 m². Pressure?

- A) 40 Pa
- B) 100 Pa
- C) 15.0 Pa
- D) 20 Pa

0553220300

Q50. While analysing a weather-observation report, In a weather observation scenario, A hydraulic piston has area ratio 5:10. An input of 40 N produces an output force of:

- A) 100 N
- B) 20 N
- C) 80.0 N
- D) 300 N

AURA

العلم نور، والجهل ظلام.

ANSWER KEY & EXPLANATIONS

0553220300

Q1. Correct Answer: C) First Law

Explanation: Inertia resists a change in motion.

Q2. Correct Answer: A) 240,000 N

Explanation: Use $F = ma$.

Q3. Correct Answer: A) 5.0 m/s²

Explanation: Use $a = F \div m$.

Q4. Correct Answer: B) Friction

Explanation: Friction opposes relative motion.

Q5. Correct Answer: D) Zero

Explanation: Constant velocity means zero acceleration.

AURA

كل سؤال علمي يقود إلى فهم أعمق.

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

ANSWER KEY & EXPLANATIONS

0553220300

Q6. Correct Answer: C) 6,000 J

Explanation: Use $W = Fd$.

Q7. Correct Answer: B) Gravitational potential energy

Explanation: Height gives gravitational potential energy.

Q8. Correct Answer: B) 243.0 J

Explanation: Use $KE = \frac{1}{2}mv^2$.

Q9. Correct Answer: C) 2000 W

Explanation: Use $P = W \div t$.

Q10. Correct Answer: B) Nine times greater

Explanation: Kinetic energy is proportional to v^2 .

AURA

بالعلم يتحول الطموح إلى إنجاز.

ANSWER KEY & EXPLANATIONS

0553220300

Q11. Correct Answer: C) Decreases

Explanation: Higher speed is associated with lower static pressure.

Q12. Correct Answer: D) Higher

Explanation: Continuity gives $A_1V_1 = A_2V_2$.

Q13. Correct Answer: C) Airfoil

Explanation: An airfoil produces a pressure difference.

Q14. Correct Answer: D) Low speed and high lift

Explanation: Induced drag is linked to lift generation.

Q15. Correct Answer: D) Buoyant force

Explanation: Buoyancy equals the weight of displaced fluid.

AURA

التعلم المستمر يصنع نجاح المستقبل.

Explanation: Gay Lussac's Law states that the pressure of a fixed mass of gas is directly proportional to its absolute temperature, provided the volume remains constant.

ANSWER KEY & EXPLANATIONS

0553220300

Q16. Correct Answer: B) Constant

Explanation: For fixed mass and temperature, PV is constant.

Q17. Correct Answer: B) Absolute temperature

Explanation: This is Charles's law.

Q18. Correct Answer: D) Double

Explanation: Volume is proportional to absolute temperature.

Q19. Correct Answer: D) Conduction

Explanation: Conduction transfers energy through contact.

Q20. Correct Answer: D) $-273.15\text{ }^{\circ}\text{C}$

Explanation: 0 K corresponds to $-273.15\text{ }^{\circ}\text{C}$.

AURA

المعرفة قوة، والمثابرة طريقها.

✓ Correct Answer: D) Conduction

ANSWER KEY & EXPLANATIONS

0553220300

Q21. Correct Answer: B) 2.86 A

Explanation: Use $I = V \div R$.

Q22. Correct Answer: C) 18 Ω

Explanation: Series resistances add.

Q23. Correct Answer: C) Coulomb

Explanation: Charge is measured in coulombs.

Q24. Correct Answer: D) Generator

Explanation: A generator produces electrical output from motion.

Q25. Correct Answer: A) Continue to operate

Explanation: Parallel branches provide separate paths.

AURA

العلم نور، والجهل ظلام.

ANSWER KEY & EXPLANATIONS

0553220300

Q26. Correct Answer: D) Hertz

Explanation: One hertz is one cycle per second.

Q27. Correct Answer: B) Reflection of sound

Explanation: Sound reflects from a surface.

Q28. Correct Answer: C) Radio wave

Explanation: Radio waves have the lowest frequency in this list.

Q29. Correct Answer: A) Refraction

Explanation: Refraction is a change in direction due to speed change.

Q30. Correct Answer: A) 3.00×10^8 m/s

Explanation: This is the accepted approximate value.

AURA

كل سؤال علمي يقود إلى فهم أعمق.

Rotational equivalent of linear force.

ANSWER KEY & EXPLANATIONS

0553220300

Q31. Correct Answer: A) Centripetal force

Explanation: Centripetal means centre-seeking.

Q32. Correct Answer: C) 72 kg·m/s

Explanation: Momentum $p = mv$.

Q33. Correct Answer: A) Time interval

Explanation: Impulse $J = F\Delta t$.

Q34. Correct Answer: C) Four times greater

Explanation: Rotational kinetic energy is proportional to ω^2 .

Q35. Correct Answer: D) Distance from the pivot

Explanation: $\tau = Fd_{\perp}$.

AURA

بالعلم يتحول الطموح إلى إنجاز.

✓ Correct Answer: D) Distance

ANSWER KEY & EXPLANATIONS

0553220300

Q36. Correct Answer: A) Mass ÷ volume

Explanation: $\rho = m/V$.

Q37. Correct Answer: A) Extension

Explanation: $F = kx$ within the elastic region.

Q38. Correct Answer: D) Pascal's principle

Explanation: This is Pascal's law.

Q39. Correct Answer: D) Evaporation

Explanation: Evaporation occurs at the surface.

Q40. Correct Answer: A) Liquid

Explanation: A liquid takes the shape of its container.

AURA

التعلم المستمر يصنع نجاح المستقبل.

ANSWER KEY & EXPLANATIONS

0553220300

Q41. Correct Answer: D) Lower

Explanation: Air becomes less dense with altitude.

Q42. Correct Answer: B) Static and dynamic pressure

Explanation: The system supports airspeed measurement.

Q43. Correct Answer: D) Lift and drag

Explanation: Flaps allow slower flight but add drag.

Q44. Correct Answer: D) Sound

Explanation: $Mach = v / \text{speed of sound}$.

Q45. Correct Answer: D) Angle of attack

Explanation: Exceeding critical AoA causes lift loss.

AURA

المعرفة قوة، والمثابرة طريقها.