

✈ ETIHAD AIRWAYS PILOT APTITUDE TEST

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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 planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Which of Newton's laws explains why a passenger moves forward when an aircraft stops suddenly?

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

Q2. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An aircraft of mass 50,000 kg accelerates at 3.0 m/s^2 . What is its net force?

- A) 150,000 N
- B) 80,000 N
- C) 200,000 N
- D) 120,000 N

Q3. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A 8 kg load experiences a net force of 40 N. Find its acceleration.

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

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Q4. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Which force acts opposite to the relative motion between an aircraft tyre and the runway?

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

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Q5. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An object moves at constant velocity. Its resultant force is:

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

SECTION 2: Work, Energy & Power

Q6. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A force of 400 N moves a crate 10 m in its direction. Work done?

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

Q7. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, What energy does an aircraft possess because of its height above the runway?

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

Q8. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A 4 kg object moves at 7 m/s. Its kinetic energy is:

- A) 50 J
- B) 25 J
- C) 100 J
- D) 98.0 J

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Q9. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An engine performs 24,000 J of work in 12 s. Its average power is:

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

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Q10. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, If an aircraft's speed triples, its kinetic energy becomes:

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

SECTION 3: Fluid Dynamics & Aerodynamics

Q11. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, According to Bernoulli's principle, when airflow speed over a wing increases, pressure generally:

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

Q12. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Air flowing through a narrower part of a tube has a speed that is generally:

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

Q13. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The cross-sectional shape designed to generate lift is called a(n):

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

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Q14. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Induced drag is most significant when an aircraft is flying at:

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

Q15. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Archimedes' principle is used to explain:

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

SECTION 4: Gas Laws & Thermodynamics

Q16. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Boyle's law relates pressure and volume when temperature is:

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

Q17. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, At constant pressure, the volume of a gas is proportional to its:

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

Q18. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An ideal gas at 320 K is heated to 640 K at constant pressure. Its volume will:

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

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Q19. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Heat transfer through direct contact in a solid is called:

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

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Q20. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Absolute zero is approximately:

- A) $-273.15\text{ }^{\circ}\text{C}$
- B) $-100\text{ }^{\circ}\text{C}$
- C) $0\text{ }^{\circ}\text{C}$
- D) $273.15\text{ }^{\circ}\text{C}$

SECTION 5: Electricity & Magnetism

Q21. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A 16 V battery is connected to a $5\text{ }\Omega$ resistor. Current?

- A) 6.00 A
- B) 1.00 A
- C) 3.20 A
- D) 3.00 A

Q22. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Two resistors of $6\text{ }\Omega$ and $8\text{ }\Omega$ are connected in series. Total resistance?

- A) $14\text{ }\Omega$
- B) $2\text{ }\Omega$
- C) $4\text{ }\Omega$
- D) $24\text{ }\Omega$

Q23. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The SI unit of electric charge is:

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

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Q24. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A device that converts mechanical energy into electrical energy is a:

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

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Q25. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, 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 planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The unit of frequency is:

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

Q27. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An echo is produced mainly by:

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

Q28. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Which electromagnetic wave has the longest wavelength?

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

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Q29. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Light changes direction when entering a different medium. This is:

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

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Q30. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The speed of light in vacuum is approximately:

- A) 3.00×10^5 m/s
- B) 3.00×10^8 m/s
- C) 9.80 m/s²
- D) 3.40×10^2 m/s

SECTION 7: Mechanics & Circular Motion

Q31. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The force directed toward the centre of circular motion is:

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

Q32. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A 7 kg object moving at 6 m/s has momentum:

- A) 42 kg·m/s
- B) 40 kg·m/s
- C) 9 kg·m/s
- D) 20 kg·m/s

Q33. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An impulse equals force multiplied by:

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

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Q34. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, For a given mass, doubling angular speed makes rotational kinetic energy:

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

Q35. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Torque is calculated as force multiplied by perpendicular:

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

SECTION 8: Properties of Matter

Q36. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Density is defined as:

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

Q37. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Hooke's law applies within the elastic limit and relates force to:

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

Q38. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Pressure in a fluid is transmitted equally in all directions according to:

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

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Q39. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A liquid changing into a gas at its surface is called:

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

Q40. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A material with a fixed volume but no fixed shape is a:

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

SECTION 9: Aviation Science Applications

Q41. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, At high altitude, air density is generally:

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

Q42. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A pitot-static system is used to sense:

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

Q43. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, The primary effect of extending flaps during approach is to increase:

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

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Q44. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, Mach number is the ratio of aircraft speed to the local speed of:

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

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Q45. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A stall occurs when the wing exceeds its critical:

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

SECTION 10: General Science & Calculations

Q46. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A 21 V circuit carries 3.0 A. Electrical power?

- A) 60 W
- B) 10 W
- C) 63.0 W
- D) 20 W

Q47. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A lever lifts 500 N using an effort of 120 N. Mechanical advantage?

- A) 3.00
- B) 4.17
- C) 2.00
- D) 5.00

Q48. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, An object falls from rest for 3.0 s. Using $g = 9.8 \text{ m/s}^2$, final speed is approximately:

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

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Q49. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A force of 100 N acts over an area of 6 m². Pressure?

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- A) 100 Pa
- B) 20 Pa
- C) 16.7 Pa
- D) 40 Pa

Q50. While planning a high-altitude navigation exercise, In a high-altitude navigation exercise, A hydraulic piston has area ratio 3:10. An input of 30 N produces an output force of:

- A) 300 N
- B) 100 N
- C) 20 N
- D) 100.0 N

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ANSWER KEY & EXPLANATIONS

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Q1. Correct Answer: C) First Law

Explanation: Inertia resists a change in motion.

Q2. Correct Answer: A) 150,000 N

Explanation: Use $F = ma$.

Q3. Correct Answer: A) 5.0 m/s²

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

Q4. Correct Answer: A) Friction

Explanation: Friction opposes relative motion.

Q5. Correct Answer: D) Zero

Explanation: Constant velocity means zero acceleration.

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

ANSWER KEY & EXPLANATIONS

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Q6. Correct Answer: D) 4,000 J

Explanation: Use $W = Fd$.

Q7. Correct Answer: D) Gravitational potential energy

Explanation: Height gives gravitational potential energy.

Q8. Correct Answer: D) 98.0 J

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

Q9. Correct Answer: D) 2000 W

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

Q10. Correct Answer: C) Nine times greater

Explanation: Kinetic energy is proportional to v^2 .

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ANSWER KEY & EXPLANATIONS

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Q11. Correct Answer: B) 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: A) 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: C) Buoyant force

Explanation: Buoyancy equals the weight of displaced fluid.

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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

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Q16. Correct Answer: D) Constant

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

Q17. Correct Answer: D) Absolute temperature

Explanation: This is Charles's law.

Q18. Correct Answer: A) Double

Explanation: Volume is proportional to absolute temperature.

Q19. Correct Answer: B) Conduction

Explanation: Conduction transfers energy through contact.

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

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

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✓ Correct Answer: D) Constant

ANSWER KEY & EXPLANATIONS

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Q21. Correct Answer: C) 3.20 A

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

Q22. Correct Answer: A) 14 Ω

Explanation: Series resistances add.

Q23. Correct Answer: B) Coulomb

Explanation: Charge is measured in coulombs.

Q24. Correct Answer: C) Generator

Explanation: A generator produces electrical output from motion.

Q25. Correct Answer: A) Continue to operate

Explanation: Parallel branches provide separate paths.

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ANSWER KEY & EXPLANATIONS

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Q26. Correct Answer: B) 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: B) Refraction

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

Q30. Correct Answer: B) 3.00×10^8 m/s

Explanation: This is the accepted approximate value.

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Rotational equivalent of linear force.

ANSWER KEY & EXPLANATIONS

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Q31. Correct Answer: C) Centripetal force

Explanation: Centripetal means centre-seeking.

Q32. Correct Answer: A) 42 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: A) Distance from the pivot

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

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✓ Correct Answer: D) Equilibrium

ANSWER KEY & EXPLANATIONS

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Q36. Correct Answer: B) Mass ÷ volume

Explanation: $\rho = m/V$.

Q37. Correct Answer: D) Extension

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

Q38. Correct Answer: A) Pascal's principle

Explanation: This is Pascal's law.

Q39. Correct Answer: A) Evaporation

Explanation: Evaporation occurs at the surface.

Q40. Correct Answer: B) Liquid

Explanation: A liquid takes the shape of its container.

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ANSWER KEY & EXPLANATIONS

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Q41. Correct Answer: D) Lower

Explanation: Air becomes less dense with altitude.

Q42. Correct Answer: C) Static and dynamic pressure

Explanation: The system supports airspeed measurement.

Q43. Correct Answer: C) Lift and drag

Explanation: Flaps allow slower flight but add drag.

Q44. Correct Answer: C) Sound

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

Q45. Correct Answer: B) Angle of attack

Explanation: Exceeding critical AoA causes lift loss.

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