



EMIRATES AIRLINE PILOT APTITUDE TEST

PHYSICS & SCIENCE — PRACTICE PAPER (Model C)

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. Normal force is always:

- A) Parallel to surface
- B) Perpendicular to surface
- C) Downwards
- D) Upwards

Q2. Friction force depends on:

- A) Area
- B) Speed
- C) Normal force
- D) Volume

Q3. Mass is a measure of:

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

Q4. Acceleration of gravity on Moon is approx:

- A) 9.8
- B) 1.6
- C) 10
- D) 0

Q5. Force required to keep 1kg at 1m/s^2 is:

- A) 1 Joule
- B) 1 Newton
- C) 1 Watt
- D) 1 Pascal

SECTION 2: Work, Energy & Power

Q6. Energy cannot be created/destroyed is:

- A) 1st Law of Thermo
- B) 2nd Law of Thermo
- C) Ohm's Law
- D) Boyle's Law

Q7. Work unit is same as:

- A) Force
- B) Power
- C) Energy
- D) Pressure

Q8. Object at rest has zero:

- A) Potential Energy
- B) Kinetic Energy
- C) Mass
- D) Weight



Q9. Watt = ?

- A) J/s
- B) J*s
- C) N/m
- D) N*m

Q10. Work to lift 1kg by 1m ($g=10$)?

- A) 1J
- B) 10J
- C) 0.1J
- D) 100J

SECTION 3: Fluid Dynamics & Aerodynamics

Q11. Airfoil lift is due to pressure:

- A) Gradient
- B) Equalization
- C) Increase
- D) Friction

Q12. Continuity equation relates:

- A) Area and Speed
- B) Pressure and Temp
- C) Mass and Weight
- D) Lift and Drag

Q13. Turbulent flow has:

- A) Smooth paths
- B) Eddies/Whirls
- C) Constant speed
- D) No friction

Q14. Boundary layer is:

- A) Wing tip
- B) Thin air layer near surface
- C) Fuel tank wall
- D) Engine casing

Q15. Mach 1 is speed of:

- A) Light
- B) Sound
- C) Earth rotation
- D) Jet



SECTION 4: Gas Laws & Thermodynamics

Q16. $V_1/T_1 = V_2/T_2$ is:

- A) Boyle
- B) Charles
- C) Dalton
- D) Pascal

Q17. Heat transfer by EM waves is:

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

Q18. Entropy always increases in:

- A) Closed system
- B) Isolated system
- C) Open system
- D) Engine

Q19. Specific heat is energy to raise temp of 1kg by:

- A) 1 degree
- B) 10 degrees
- C) 100 degrees
- D) 0.1 degree

Q20. Ideal gas law constant R depends on:

- A) Gas type
- B) Temp
- C) Pressure
- D) Units used

SECTION 5: Electricity & Magnetism

Q21. Voltmeter is connected in:

- A) Series
- B) Parallel
- C) Both
- D) Neither

Q22. Ammeter has:

- A) High resistance
- B) Low resistance
- C) No resistance
- D) Infinite resistance

Q23. Transformer works on:

- A) DC only
- B) AC only
- C) Both
- D) Batteries



Q24. Coulomb is unit of:

- A) Current
- B) Voltage
- C) Charge
- D) Energy

Q25. Earth's magnetic field resembles a:

- A) Ring magnet
- B) Bar magnet
- C) Sphere magnet
- D) Point charge

SECTION 6: Waves, Sound & Optics

Q26. Wavelength * Frequency = ?

- A) Period
- B) Amplitude
- C) Wave speed
- D) Energy

Q27. Human hearing range (Hz):

- A) 0-100
- B) 20-20,000
- C) 1,000-1,000,000
- D) 20,000-100,000

Q28. Total internal reflection happens at:

- A) Small angles
- B) Critical angle
- C) Any angle
- D) 90 degrees

Q29. Dispersion creates a:

- A) Shadow
- B) Rainbow
- C) Mirror image
- D) Black hole

Q30. Photon is a particle of:

- A) Sound
- B) Light
- C) Matter
- D) Gravity



SECTION 7: Mechanics & Circular Motion

Q31. Angular momentum is conserved if:

- A) Force is zero
- B) Torque is zero
- C) Speed is constant
- D) Mass is constant

Q32. Centripetal acceleration $a = ?$

- A) v/r
- B) v^2/r
- C) $v \cdot r$
- D) v^2/r^2

Q33. Escape velocity depends on:

- A) Object mass
- B) Planet mass/radius
- C) Launch angle
- D) Atmospheric pressure

Q34. Period of a pendulum depends on:

- A) Mass
- B) Amplitude
- C) Length
- D) Color

Q35. Weightlessness in orbit is due to:

- A) No gravity
- B) Constant free fall
- C) Vacuum
- D) High speed

SECTION 8: Properties of Matter

Q36. Archimedes: Buoyant force = weight of:

- A) Object
- B) Displaced fluid
- C) Container
- D) Air

Q37. Mercury is used in barometers because of high:

- A) Temp
- B) Density
- C) Cost
- D) Friction

Q38. Viscosity of liquids usually:

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



Q39. Pascal is unit of:

- A) Force
- B) Power
- C) Pressure
- D) Energy

Q40. Elastic limit is where object:

- A) Breaks
- B) Permanently deforms
- C) Melts
- D) Vibrates

SECTION 9: Aviation Science Applications

Q41. Airspeed indicator uses difference between:

- A) Pitot and Static
- B) Fuel and Air
- C) Cabin and Outside
- D) Left and Right

Q42. Critical Angle of Attack is:

- A) 0 degrees
- B) 5 degrees
- C) Approx 15-20 degrees
- D) 45 degrees

Q43. Turn coordinator shows:

- A) Speed
- B) Altitude
- C) Rate of turn/roll
- D) Fuel

Q44. Spoilers on wings increase:

- A) Lift
- B) Drag
- C) Speed
- D) Fuel

Q45. Engine thrust in jets is from:

- A) Propeller
- B) Newton's 3rd Law
- C) Bernoulli
- D) Magnetism



SECTION 10: General Science & Calculations

Q46. Power of 10V and 2A?

- A) 5W
- B) 12W
- C) 20W
- D) 0.2W

Q47. Speed of 1000m in 20s?

- A) 20
- B) 50
- C) 200
- D) 100

Q48. Force to move 5kg at 2m/s²?

- A) 2.5
- B) 7
- C) 10
- D) 25

Q49. Density of 500kg in 10m³?

- A) 5000
- B) 50
- C) 510
- D) 490

Q50. Pressure of 200N on 4m²?

- A) 800
- B) 50
- C) 196
- D) 204



ANSWER KEY & EXPLANATIONS

Q1. ✓ Correct Answer: B) Perpendicular to surface

Explanation: Normal force acts at 90 degrees to the contact surface.

Q2. ✓ Correct Answer: C) Normal force

Explanation: $F_{\text{friction}} = \mu * F_{\text{normal}}$.

Q3. ✓ Correct Answer: C) Inertia

Explanation: Mass quantifies the resistance to acceleration.

Q4. ✓ Correct Answer: B) 1.6

Explanation: Moon's gravity is about 1/6th of Earth's.

Q5. ✓ Correct Answer: B) 1 Newton

Explanation: Definition of the Newton.

Q6. ✓ Correct Answer: A) 1st Law of Thermo

Explanation: Conservation of energy principle.

Q7. ✓ Correct Answer: C) Energy

Explanation: Both measured in Joules.

Q8. ✓ Correct Answer: B) Kinetic Energy

Explanation: $v=0$ implies $KE=0$.

Q9. ✓ Correct Answer: A) J/s

Explanation: Power is energy rate.

Q10. ✓ Correct Answer: B) 10J

Explanation: $W = mgh = 1 * 10 * 1 = 10 \text{ J}$.

Q11. ✓ Correct Answer: A) Gradient

Explanation: Difference between top and bottom pressures.

Q12. ✓ Correct Answer: A) Area and Speed

Explanation: $A_1V_1 = A_2V_2$.

Q13. ✓ Correct Answer: B) Eddies/Whirls

Explanation: Irregular fluid motion.

Q14. ✓ Correct Answer: B) Thin air layer near surface

Explanation: Where viscosity effects are significant.

Q15. ✓ Correct Answer: B) Sound

Explanation: Reference speed for supersonic flight.



Q16. ✓ Correct Answer: B) Charles

Explanation: Charles's Law for isobaric processes.

Q17. ✓ Correct Answer: C) Radiation

Explanation: Requires no medium.

Q18. ✓ Correct Answer: B) Isolated system

Explanation: 2nd Law of Thermodynamics.

Q19. ✓ Correct Answer: A) 1 degree

Explanation: Definition of specific heat capacity.

Q20. ✓ Correct Answer: D) Units used

Explanation: Numerical value varies with units (J/mol·K etc).

Q21. ✓ Correct Answer: B) Parallel

Explanation: To measure potential difference across a component.

Q22. ✓ Correct Answer: B) Low resistance

Explanation: To minimize impact on the circuit current.

Q23. ✓ Correct Answer: B) AC only

Explanation: Requires changing magnetic flux.

Q24. ✓ Correct Answer: C) Charge

Explanation: SI unit of electric charge.

Q25. ✓ Correct Answer: B) Bar magnet

Explanation: Dipolar field structure.

Q26. ✓ Correct Answer: C) Wave speed

Explanation: $v = \lambda * f$.

Q27. ✓ Correct Answer: B) 20-20,000

Explanation: Standard audible range.

Q28. ✓ Correct Answer: B) Critical angle

Explanation: Beyond this angle, light is fully reflected.

Q29. ✓ Correct Answer: B) Rainbow

Explanation: Splitting light into colors.

Q30. ✓ Correct Answer: B) Light

Explanation: Quantum of EM radiation.

Q31. ✓ Correct Answer: B) Torque is zero

Explanation: Rotational version of Newton's 1st law.

Q32. ✓ Correct Answer: B) v^2/r

Explanation: Formula for circular acceleration.

Q33. ✓ Correct Answer: B) Planet mass/radius

Explanation: $v_e = \sqrt{2GM/R}$.

Q34. ✓ Correct Answer: C) Length

Explanation: $T = 2\pi * \sqrt{L/g}$.

Q35. ✓ Correct Answer: B) Constant free fall

Explanation: Orbiting is falling around the Earth.

Q36. ✓ Correct Answer: B) Displaced fluid

Explanation: Fundamental law of buoyancy.

Q37. ✓ Correct Answer: B) Density

Explanation: Allows for a shorter, practical tube height.

Q38. ✓ Correct Answer: B) Decreases with temp

Explanation: Liquids get thinner when heated.

Q39. ✓ Correct Answer: C) Pressure

Explanation: $1 \text{ Pa} = 1 \text{ N/m}^2$.

Q40. ✓ Correct Answer: B) Permanently deforms

Explanation: Point beyond which it won't return to original shape.

Q41. ✓ Correct Answer: A) Pitot and Static

Explanation: Dynamic pressure = Total - Static.

Q42. ✓ Correct Answer: C) Approx 15-20 degrees

Explanation: Typical stall angle for most airfoils.

Q43. ✓ Correct Answer: C) Rate of turn/roll

Explanation: Gyroscopic flight instrument.

Q44. ✓ Correct Answer: B) Drag

Explanation: And decrease lift (spoil it).

Q45. ✓ Correct Answer: B) Newton's 3rd Law

Explanation: Action (exhaust) and reaction (thrust).

Q46. ✓ Correct Answer: C) 20W

Explanation: $P = V * I = 10 * 2 = 20 \text{ W}$.

Q47. ✓ Correct Answer: B) 50

Explanation: $v = 1000 / 20 = 50 \text{ m/s}$.

Q48. ✓ Correct Answer: C) 10

Explanation: $F = 5 * 2 = 10 \text{ N}$.

Q49. ✓ Correct Answer: B) 50

Explanation: $\rho = 500 / 10 = 50 \text{ kg/m}^3$.

Q50. ✓ Correct Answer: B) 50

Explanation: $P = 200 / 4 = 50 \text{ Pa}$.



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