



EMIRATES AIRLINE PILOT APTITUDE TEST

PHYSICS & SCIENCE — PRACTICE PAPER (Model B)

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 law states $F = ma$?

- A) 1st
- B) 2nd
- C) 3rd
- D) Gravity

Q2. An object of 10kg is pushed with 50N. Acceleration?

- A) 2
- B) 5
- C) 10
- D) 500

Q3. Action-reaction is which law?

- A) 1st
- B) 2nd
- C) 3rd
- D) 4th

Q4. Weight of 5kg object on Earth ($g=10$)?

- A) 5 N
- B) 50 N
- C) 10 N
- D) 0.5 N

Q5. Vector quantities have:

- A) Size only
- B) Direction only
- C) Both
- D) Neither

SECTION 2: Work, Energy & Power

Q6. Work done = Force * ?

- A) Time
- B) Distance
- C) Velocity
- D) Mass

Q7. Kinetic energy formula?

- A) mgh
- B) $\frac{1}{2}mv^2$
- C) Fd
- D) ma

Q8. Unit of Energy?

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



Q9. Potential energy at 10m for 2kg ($g=10$)?

- A) 20J
- B) 100J
- C) 200J
- D) 2000J

Q10. 1 Horsepower is approx:

- A) 500W
- B) 746W
- C) 1000W
- D) 250W

SECTION 3: Fluid Dynamics & Aerodynamics

Q11. Fluid speed increases, static pressure:

- A) Rises
- B) Falls
- C) Stays
- D) Stops

Q12. Viscosity is fluid:

- A) Density
- B) Weight
- C) Thickness/Friction
- D) Temperature

Q13. Lift is generated by:

- A) High pressure above wing
- B) Low pressure above wing
- C) Gravity
- D) Friction

Q14. Angle of Attack is angle between wind and:

- A) Ground
- B) Vertical axis
- C) Chord line
- D) Span

Q15. Parasite drag increases with:

- A) Speed squared
- B) Weight
- C) Altitude
- D) Humidity



SECTION 4: Gas Laws & Thermodynamics

Q16. $P_1V_1 = P_2V_2$ is:

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

Q17. Standard temp at sea level (Celsius)?

- A) 0
- B) 15
- C) 25
- D) 100

Q18. Convection happens in:

- A) Solids only
- B) Fluids (Liquids/Gases)
- C) Vacuum
- D) Crystals

Q19. Water freezes at (Kelvin):

- A) 0 K
- B) 100 K
- C) 273 K
- D) 373 K

Q20. Pressure increases if volume is:

- A) Increased
- B) Decreased
- C) Constant
- D) Zero

SECTION 5: Electricity & Magnetism

Q21. Current unit?

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

Q22. Resistance in series: $R_{\text{total}} = ?$

- A) $R_1 * R_2$
- B) $R_1 + R_2$
- C) $1/R_1 + 1/R_2$
- D) $R_1 - R_2$

Q23. Electric power $P = ?$

- A) V/I
- B) I/V
- C) $V*I$
- D) $V+I$

Q24. Magnetic North is:

- A) Same as True North
- B) Moving
- C) At the equator
- D) Fixed forever

Q25. Insulators have:

- A) Low resistance
- B) High resistance
- C) No resistance
- D) Free electrons



SECTION 6: Waves, Sound & Optics

Q26. Frequency unit?

- A) Meter
- B) Second
- C) Hertz
- D) Newton

Q27. Light is a:

- A) Longitudinal wave
- B) Transverse wave
- C) Mechanical wave
- D) Sound wave

Q28. Refractive index of vacuum is:

- A) 0
- B) 1
- C) 1.33
- D) 1.5

Q29. Echo is caused by wave:

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

Q30. Concave mirrors:

- A) Converge light
- B) Diverge light
- C) Block light
- D) Filter light



SECTION 7: Mechanics & Circular Motion

Q31. Centrifugal force is:

- A) Real force
- B) Apparent/Fictitious
- C) Gravitational
- D) Magnetic

Q32. $G = 6.67 \times 10^{-11}$ is constant for:

- A) Earth only
- B) Sun only
- C) Universe
- D) Lab only

Q33. Momentum of 5kg at 4m/s?

- A) 1.25
- B) 9
- C) 20
- D) 25

Q34. Impulse = Force * ?

- A) Mass
- B) Time
- C) Distance
- D) Velocity

Q35. Angular velocity unit?

- A) m/s
- B) rad/s
- C) degree
- D) rpm

SECTION 8: Properties of Matter

Q36. Specific Gravity of water is:

- A) 0
- B) 1
- C) 10
- D) 1000

Q37. Pressure = Force / ?

- A) Volume
- B) Area
- C) Mass
- D) Length

Q38. Solids have:

- A) No shape
- B) No volume
- C) Fixed shape/volume
- D) High flow



Q39. Surface tension happens in:

- A) Solids
- B) Liquids
- C) Gases
- D) Vacuum

Q40. Strain is change in length / ?

- A) Force
- B) Original length
- C) Mass
- D) Time

SECTION 9: Aviation Science Applications

Q41. Pitot tube measures:

- A) Static pressure
- B) Total pressure
- C) Cabin pressure
- D) Fuel pressure

Q42. Altimeter uses:

- A) Static pressure
- B) Pitot pressure
- C) Dynamic pressure
- D) Gyroscope

Q43. Stall occurs when wing exceeds:

- A) Max speed
- B) Max altitude
- C) Critical AoA
- D) Max weight

Q44. Gyroscope maintains:

- A) Pressure
- B) Temperature
- C) Orientation in space
- D) Fuel level

Q45. Aspect ratio = Span / ?

- A) Thickness
- B) Chord
- C) Weight
- D) Drag



SECTION 10: General Science & Calculations

Q46. 20V, 5A. Resistance?

- A) 4
- B) 100
- C) 0.25
- D) 15

Q47. Distance if $v=50$, $t=10$?

- A) 5
- B) 60
- C) 500
- D) 40

Q48. Acceleration of 2kg with 20N force?

- A) 10
- B) 40
- C) 0.1
- D) 18

Q49. 100J in 2s. Power?

- A) 50
- B) 200
- C) 98
- D) 102

Q50. Density of 100kg in 2m^3 ?

- A) 200
- B) 50
- C) 102
- D) 0.02



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ANSWER KEY & EXPLANATIONS

Q1. ✓ Correct Answer: B) 2nd

Explanation: Force equals mass times acceleration.

Q2. ✓ Correct Answer: B) 5

Explanation: $a = F/m = 50/10 = 5 \text{ m/s}^2$.

Q3. ✓ Correct Answer: C) 3rd

Explanation: Every action has an equal and opposite reaction.

Q4. ✓ Correct Answer: B) 50 N

Explanation: $W = m * g = 5 * 10 = 50 \text{ N}$.

Q5. ✓ Correct Answer: C) Both

Explanation: Vectors define magnitude and direction.

Q6. ✓ Correct Answer: B) Distance

Explanation: $W = F * d$.

Q7. ✓ Correct Answer: B) $1/2mv^2$

Explanation: KE is proportional to mass and square of velocity.

Q8. ✓ Correct Answer: C) Joule

Explanation: Joule is the SI unit of work and energy.

Q9. ✓ Correct Answer: C) 200J

Explanation: $PE = 2 * 10 * 10 = 200 \text{ J}$.

Q10. ✓ Correct Answer: B) 746W

Explanation: Standard conversion unit.

Q11. ✓ Correct Answer: B) Falls

Explanation: Bernoulli's principle.

Q12. ✓ Correct Answer: C) Thickness/Friction

Explanation: Measure of resistance to flow.

Q13. ✓ Correct Answer: B) Low pressure above wing

Explanation: Air moves faster over the top, lowering pressure.

Q14. ✓ Correct Answer: C) Chord line

Explanation: Definition of AoA.

Q15. ✓ Correct Answer: A) Speed squared

Explanation: Drag increases rapidly as speed increases.



Q16. ✓ Correct Answer: B) Boyle

Explanation: Boyle's Law for isothermal processes.

Q17. ✓ Correct Answer: B) 15

Explanation: ISA standard temperature.

Q18. ✓ Correct Answer: B) Fluids (Liquids/Gases)

Explanation: Transfer by bulk movement of fluid.

Q19. ✓ Correct Answer: C) 273 K

Explanation: $0^{\circ}\text{C} + 273 = 273 \text{ K}$.

Q20. ✓ Correct Answer: B) Decreased

Explanation: Boyle's Law relationship.

Q21. ✓ Correct Answer: C) Ampere

Explanation: Flow of charge per second.

Q22. ✓ Correct Answer: B) $R_1 + R_2$

Explanation: Series resistances add up.

Q23. ✓ Correct Answer: C) $V \cdot I$

Explanation: Power is voltage times current.

Q24. ✓ Correct Answer: B) Moving

Explanation: Magnetic poles shift over time.

Q25. ✓ Correct Answer: B) High resistance

Explanation: They block current flow.

Q26. ✓ Correct Answer: C) Hertz

Explanation: Cycles per second.

Q27. ✓ Correct Answer: B) Transverse wave

Explanation: Oscillations are perpendicular to direction.

Q28. ✓ Correct Answer: B) 1

Explanation: Light speed is max in vacuum.

Q29. ✓ Correct Answer: B) Reflection

Explanation: Sound bouncing back.

Q30. ✓ Correct Answer: A) Converge light

Explanation: They focus rays to a point.

Q31. ✓ Correct Answer: B) Apparent/Fictitious

Explanation: Experienced in a rotating frame due to inertia.



Q32. ✓ Correct Answer: C) Universe

Explanation: Universal Gravitational Constant.

Q33. ✓ Correct Answer: C) 20

Explanation: $5 * 4 = 20 \text{ kg} \cdot \text{m/s}$.

Q34. ✓ Correct Answer: B) Time

Explanation: Change in momentum.

Q35. ✓ Correct Answer: B) rad/s

Explanation: Standard SI unit.

Q36. ✓ Correct Answer: B) 1

Explanation: Water is the reference standard.

Q37. ✓ Correct Answer: B) Area

Explanation: $P = F / A$.

Q38. ✓ Correct Answer: C) Fixed shape/volume

Explanation: Molecules are tightly packed.

Q39. ✓ Correct Answer: B) Liquids

Explanation: Due to cohesive forces at surface.

Q40. ✓ Correct Answer: B) Original length

Explanation: Dimensionless ratio.

Q41. ✓ Correct Answer: B) Total pressure

Explanation: Used for airspeed calculation.

Q42. ✓ Correct Answer: A) Static pressure

Explanation: Measures ambient pressure decrease.

Q43. ✓ Correct Answer: C) Critical AoA

Explanation: Angle of attack where lift drops.

Q44. ✓ Correct Answer: C) Orientation in space

Explanation: Rigidity in space principle.

Q45. ✓ Correct Answer: B) Chord

Explanation: Span-to-chord ratio.

Q46. ✓ Correct Answer: A) 4

Explanation: $R = V / I = 20 / 5 = 4 \text{ Ohm}$.

Q47. ✓ Correct Answer: C) 500

Explanation: $d = v * t = 50 * 10 = 500 \text{ m}$.

Q48. ✓ Correct Answer: A) 10

Explanation: $a = 20 / 2 = 10 \text{ m/s}^2$.

Q49. ✓ Correct Answer: A) 50

Explanation: $P = 100 / 2 = 50 \text{ W}$.

Q50. ✓ Correct Answer: B) 50

Explanation: $\rho = 100 / 2 = 50 \text{ kg/m}^3$.



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