

CIE A-Level Physics 9702 Paper 1 Practice

Paper (Multiple Choice)

Total: 40 marks · 1 h 15 min · 40 multiple-choice questions

Data and formulae

Quantity	Value
Acceleration of free fall g	9.81 m s^{-2}
Elementary charge e	$1.60 \times 10^{-19} \text{ C}$
Speed of light c	$3.00 \times 10^8 \text{ m s}^{-1}$
Density of water	$1,000 \text{ kg m}^{-3}$
Speed of sound in air at 20°C	340 m s^{-1}
Electron mass	$9.11 \times 10^{-31} \text{ kg}$

1. Which of the following is the same unit as the joule? [1]

- (A) $\text{kg m}^2 \text{s}^{-2}$
- (B) $\text{kg m}^{-1} \text{s}^{-2}$
- (C) $\text{kg m}^2 \text{s}^{-3}$
- (D) kg m s^{-2}

2. A car accelerates uniformly from rest to 30 m s^{-1} in 6.0 s . What is its displacement? [1]

- (A) 180 m
- (B) 45 m
- (C) 90 m
- (D) 270 m

3. A ball is thrown vertically upwards at 20 m s^{-1} ($g = 9.81 \text{ m s}^{-2}$). Its maximum height above the hand is about [1]

- (A) 2.04 m
- (B) 10.2 m
- (C) 20.4 m
- (D) 40.8 m

4. A small ball is projected horizontally at 15 m s^{-1} from a height of 20 m ($g = 9.81 \text{ m s}^{-2}$). Its horizontal range is about [1]

- (A) 60.6 m
- (B) 30.3 m
- (C) 15.2 m
- (D) 45.4 m

5. A 2.0 kg object on a frictionless horizontal table is pushed by a resultant horizontal force of 8.0 N . Its acceleration is [1]

- (A) 16 m s^{-2}
- (B) 8.0 m s^{-2}
- (C) 4.0 m s^{-2}
- (D) 2.0 m s^{-2}

6. A $1,200 \text{ kg}$ car travelling at 15 m s^{-1} hits a wall and stops in 0.40 s . The average force on the car is [1]

- (A) $1.8 \times 10^4 \text{ N}$
- (B) $1.8 \times 10^5 \text{ N}$
- (C) $4.5 \times 10^3 \text{ N}$
- (D) $4.5 \times 10^4 \text{ N}$

7. A 3.0 kg body moving at 4.0 m s^{-1} collides with a stationary 1.0 kg body and they stick together. The kinetic energy lost is [1]

- (A) 6.0 J
- (B) 0 J
- (C) 12 J
- (D) 3.0 J

8. A motor raises a 25 kg load through 8.0 m in 4.0 s at constant speed ($g = 9.81 \text{ m s}^{-2}$). Its useful output power is [1]

- (A) $1,960 \text{ W}$
- (B) 490 W
- (C) 200 W
- (D) $3,920 \text{ W}$

9. A motor takes 2.4 kW of electrical power and gives 1.8 kW of mechanical power. Its efficiency is [1]

- (A) 80%
- (B) 60%
- (C) 25%
- (D) 75%

10. A uniform metre rule is pivoted at the 30 cm mark. A 4.0 N weight hangs at the 0 cm end. What weight at the 100 cm end balances it? (weight of the rule ignored) [1]

- (A) 2.4 N
- (B) 1.7 N
- (C) 1.0 N
- (D) 3.4 N

11. A pair of equal and opposite parallel forces of 6.0 N are 0.25 m apart. The torque of this couple is [1]

- (A) 1.5 N m
- (B) 3.0 N m
- (C) 24 N m
- (D) 0.75 N m

12. A spring of spring constant 40 N m⁻¹ is extended by 0.15 m. The elastic potential energy stored is [1]

- (A) 6.0 J
- (B) 0.45 J
- (C) 0.90 J
- (D) 0.225 J

13. A metal wire of diameter 0.40 mm carries a tension of 50 N. The stress in the wire is about [1]

- (A) 8.0×10^8 Pa
- (B) 1.6×10^9 Pa
- (C) 2.0×10^8 Pa
- (D) 4.0×10^8 Pa

14. The same wire is 2.0 m long and extends by 1.2 mm under that tension. Its Young modulus is about [1]

- (A) 6.6×10^{11} Pa
- (B) 6.6×10^8 Pa
- (C) 1.3×10^{12} Pa
- (D) 3.3×10^{11} Pa

15. A body of volume 0.20 m³ is fully immersed in water (density 1,000 kg m⁻³, g = 9.81 m s⁻²). The upthrust on it is [1]

- (A) 800 N
- (B) 1,960 N
- (C) 1,600 N
- (D) 19,600 N

16. The pressure due to the water at a depth of 2.5 m is about (density 1,000 kg m⁻³, g = 9.81 m s⁻²) [1]

- (A) 2.5×10^6 Pa
- (B) 2.5×10^4 Pa
- (C) 2.5×10^5 Pa
- (D) 2.5×10^3 Pa

17. A sound wave of frequency 512 Hz travels at 340 m s⁻¹ in air. Its wavelength is [1]

- (A) 1.5 m
- (B) 1.7×10^5 m
- (C) 0.33 m
- (D) 0.66 m

18. A transverse wave has period 0.20 s and wavelength 0.80 m. Its speed is [1]

- (A) 16 m s⁻¹
- (B) 8.0 m s⁻¹
- (C) 2.0 m s⁻¹
- (D) 4.0 m s⁻¹

19. Which of the following waves can be polarised? [1]

- (A) Longitudinal waves such as sound
- (B) Transverse waves such as light
- (C) All mechanical waves
- (D) Only radio waves

20. Light travels from air into glass of refractive index 1.50 at an angle of incidence of 30 degrees.

The angle of refraction is about [1]

- (A) 14.5°
- (B) 48.6°
- (C) 19.5°
- (D) 30.0°

21. A medium has refractive index 1.50. Its critical angle with air is about [1]

- (A) 56.3°
- (B) 48.6°
- (C) 30.0°
- (D) 41.8°

22. Two coherent point sources emit waves of wavelength 0.60 m. At the second-order maximum the path difference is [1]

- (A) 0.30 m
- (B) 1.8 m
- (C) 0.60 m
- (D) 1.2 m

23. A string 1.2 m long is fixed at both ends. The wave speed is 240 m s⁻¹. The frequency of its second harmonic (first overtone) is [1]

- (A) 200 Hz
- (B) 400 Hz
- (C) 240 Hz
- (D) 100 Hz

24. A diffraction grating has 500 lines per millimetre. Monochromatic light of wavelength 600 nm is incident normally. The first-order diffraction angle is about [1]

- (A) 30.0°
- (B) 17.5°
- (C) 36.9°
- (D) 8.6°

25. Two waves of equal amplitude and frequency superpose in antiphase. The amplitude of the resultant is [1]

- (A) Zero
- (B) Twice the original amplitude
- (C) Half the original amplitude
- (D) The same as the original amplitude

26. A current of 2.0 A flows for 5.0 minutes. The number of electrons passing a section is about ($e = 1.60 \times 10^{-19}$ C) [1]

- (A) 3.8×10^{18}
- (B) 6.0×10^{21}
- (C) 3.8×10^{21}
- (D) 3.8×10^{20}

27. A copper wire of cross-sectional area 1.0 mm^2 carries 2.0 A. The free-electron number density is $8.5 \times 10^{28} \text{ m}^{-3}$. The drift velocity is about [1]

- (A) $1.5 \times 10^{-2} \text{ m s}^{-1}$
- (B) $1.5 \times 10^{-4} \text{ m s}^{-1}$
- (C) $1.5 \times 10^{-5} \text{ m s}^{-1}$
- (D) $1.5 \times 10^{-3} \text{ m s}^{-1}$

28. A copper wire 2.0 m long has cross-sectional area $1.0 \times 10^{-6} \text{ m}^2$ and resistivity $1.7 \times 10^{-8} \text{ ohm m}$. Its resistance is [1]

- (A) 0.068Ω
- (B) 0.017Ω
- (C) 3.4Ω
- (D) 0.034Ω

29. A 12 V supply of negligible internal resistance feeds 4.0 ohm in series with a parallel pair of 6.0 ohm and 3.0 ohm. The current in the 6.0 ohm resistor is [1]

- (A) 2.0 A
- (B) 0.67 A

- (C) 1.3 A
- (D) 3.0 A

30. An electric kettle rated 2.0 kW at 230 V. The resistance of its element is about [1]

- (A) 13.2 Ω
- (B) 115 Ω
- (C) 26.5 Ω
- (D) 53.0 Ω

31. A cell of e.m.f. 9.0 V and internal resistance 0.50 ohm is connected to a 4.0 ohm resistor. The terminal p.d. is [1]

- (A) 8.0 V
- (B) 8.5 V
- (C) 7.0 V
- (D) 9.0 V

32. A 12 V supply is connected across 2.0 kohm and 6.0 kohm in series. The p.d. across the 6.0 kohm resistor is [1]

- (A) 6.0 V
- (B) 3.0 V
- (C) 9.0 V
- (D) 12 V

33. Kirchhoff first law (the junction rule) follows from [1]

- (A) conservation of energy
- (B) conservation of resistance
- (C) conservation of charge
- (D) conservation of momentum

34. The quark composition of a proton is [1]

- (A) udd
- (B) uud
- (C) uus
- (D) uds

35. Which of the following particles is a lepton? [1]

- (A) Proton
- (B) Neutron
- (C) Pion
- (D) Neutrino

36. In beta-minus decay the quark change inside the nucleus is [1]

- (A) down quark $\rightarrow$ up quark
- (B) up quark $\rightarrow$ down quark

- (C) up quark $\rightarrow$ gluon
- (D) down quark $\rightarrow$ strange quark

37. A nucleus contains 6 protons and 8 neutrons. Its nucleon number A is [1]

- (A) 6
- (B) 14
- (C) 8
- (D) 22

38. A length is measured as 12.0 ± 0.2 mm. Its percentage uncertainty is [1]

- (A) 17%
- (B) 1.7%
- (C) 0.2%
- (D) 2.0%

39. Which of the following is a scalar quantity? [1]

- (A) Kinetic energy
- (B) Velocity
- (C) Acceleration
- (D) Momentum

40. Repeating a measurement and averaging mainly reduces [1]

- (A) all three equally
- (B) random error
- (C) systematic error
- (D) zero error