



IB Demystified

Examiners · Moderators · Mentors

Physics

Standard Level

Paper 1A — Mock Examination

Mock Exam 2

Calculator required

Time allowed: **50 minutes**

Maximum mark: **25 marks**

Candidate information

Candidate name:

Session number:

Date:

Topic emphasis: mechanics, thermal physics, waves and oscillations, fields, nuclear and astrophysics

Instructions to candidates

- Write your session number in the box on the cover.
- Do not open this examination paper until you are told to do so.
- Answer all questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer grid provided on page 3.
- A calculator is required for this paper.
- A clean copy of the physics data booklet is required for this paper.
- Each question is worth one mark. No marks are deducted for incorrect answers, so you should attempt every question.
- The maximum mark for this paper is **[25 marks]**.

Where necessary, take the magnitude of the gravitational field strength at the Earth's surface to be $g = 9.81 \text{ N kg}^{-1}$ and the speed of sound in air to be 340 m s^{-1} . Values of all other constants are given in the data booklet.

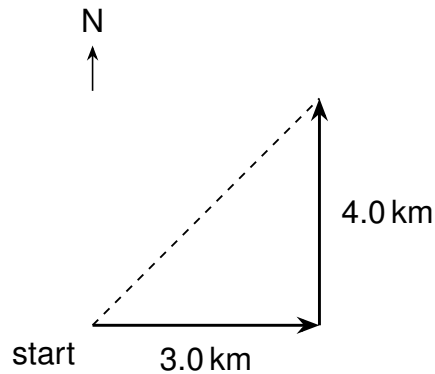
Only one response per question will be marked. If you change an answer, make sure the response you do not want is completely erased or crossed out.

Answer grid

Shade or circle one letter for each question.

Q	A	B	C	D		Q	A	B	C	D
1	☐	☐	☐	☐		14	☐	☐	☐	☐
2	☐	☐	☐	☐		15	☐	☐	☐	☐
3	☐	☐	☐	☐		16	☐	☐	☐	☐
4	☐	☐	☐	☐		17	☐	☐	☐	☐
5	☐	☐	☐	☐		18	☐	☐	☐	☐
6	☐	☐	☐	☐		19	☐	☐	☐	☐
7	☐	☐	☐	☐		20	☐	☐	☐	☐
8	☐	☐	☐	☐		21	☐	☐	☐	☐
9	☐	☐	☐	☐		22	☐	☐	☐	☐
10	☐	☐	☐	☐		23	☐	☐	☐	☐
11	☐	☐	☐	☐		24	☐	☐	☐	☐
12	☐	☐	☐	☐		25	☐	☐	☐	☐
13	☐	☐	☐	☐		Total	/ 25			

1. A car travels 3.0 km due east and then 4.0 km due north. The total journey time is 25 minutes. What is the magnitude of the average velocity of the car?



- A. 2.0 m s^{-1}
B. 3.3 m s^{-1}
C. 4.7 m s^{-1}
D. 5.0 m s^{-1}

[1]

2. A ball is released from rest and falls freely through a vertical distance of 45 m. Air resistance is negligible. How long does the ball take to fall?

- A. 3.0 s
B. 4.6 s
C. 6.1 s
D. 9.2 s

[1]

3. A book rests on a horizontal table. Which force is the Newton's third law pair to the weight of the book?

- A.** The normal force exerted by the table on the book
- B.** The normal force exerted by the book on the table
- C.** The gravitational force exerted by the book on the Earth
- D.** The weight of the table

[1]

4. A person of mass 70 kg stands on a bathroom scale inside a lift. The lift accelerates upwards at 2.0 m s^{-2} . What is the reading on the scale?

- A.** 140 N
- B.** 550 N
- C.** 690 N
- D.** 830 N

[1]

5. An object of mass 3.0 kg, initially at rest, explodes into two fragments of mass 1.0 kg and 2.0 kg. The 1.0 kg fragment moves off at 6.0 m s^{-1} . What is the speed of the 2.0 kg fragment?

- A.** 1.5 m s^{-1}
- B.** 2.0 m s^{-1}
- C.** 3.0 m s^{-1}
- D.** 6.0 m s^{-1}

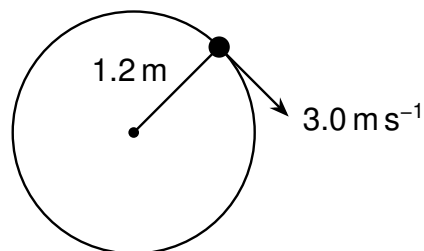
[1]

6. A force of 50 N acts at an angle of 60° to the horizontal on a box. The box moves 4.0 m horizontally. What is the work done on the box by the force?

A. 100 J
B. 173 J
C. 200 J
D. 400 J

[1]

7. A ball of mass 0.50 kg attached to a string moves in a horizontal circle of radius 1.2 m at a constant speed of 3.0 m s^{-1} . What is the magnitude of the resultant force acting on the ball?



A. 1.3 N
B. 1.9 N
C. 3.8 N
D. 7.5 N

[1]

8. The specific latent heat of fusion of ice is $3.3 \times 10^5 \text{ J kg}^{-1}$. How much energy is required to melt 0.25 kg of ice at 0°C ?

- A. $3.3 \times 10^4 \text{ J}$
- B. $8.3 \times 10^4 \text{ J}$
- C. $1.3 \times 10^5 \text{ J}$
- D. $3.3 \times 10^5 \text{ J}$

[1]

9. Which is correct about the internal energy of an ideal gas?

- A. It is the total random kinetic energy of the molecules
- B. It is the total intermolecular potential energy of the molecules
- C. It is the sum of the kinetic and the potential energies of the molecules
- D. It is the thermal energy that has been transferred to the gas

[1]

10. A fixed mass of an ideal gas has a volume of 0.030 m^3 at a temperature of 300 K . The gas is heated to 400 K at constant pressure. What is the new volume of the gas?

- A. 0.023 m^3
- B. 0.030 m^3
- C. 0.040 m^3
- D. 0.053 m^3

[1]

11. What is the average random kinetic energy of a molecule of an ideal gas at a temperature of 300 K?

- A. $2.1 \times 10^{-21} \text{ J}$
- B. $3.1 \times 10^{-21} \text{ J}$
- C. $4.1 \times 10^{-21} \text{ J}$
- D. $6.2 \times 10^{-21} \text{ J}$

[1]

12. Which gas in the Earth's atmosphere is **not** a significant greenhouse gas?

- A. Methane
- B. Water vapour
- C. Carbon dioxide
- D. Nitrogen

[1]

13. A sound wave travels through air. Which is correct about the motion of the air molecules?

- A. They oscillate at right angles to the direction of energy transfer
- B. They oscillate parallel to the direction of energy transfer
- C. They travel with the wave at the speed of the wave
- D. They move in circles about their equilibrium positions

[1]

14. An object oscillating with simple harmonic motion has amplitude A and total energy E . What is the kinetic energy of the object when its displacement is $\frac{A}{2}$?

- A. $\frac{E}{4}$
- B. $\frac{E}{2}$
- C. $\frac{3E}{4}$
- D. E

[1]

15. Monochromatic light of wavelength 600 nm is incident on two narrow slits separated by 0.50 mm. An interference pattern is observed on a screen 2.0 m from the slits. What is the separation of adjacent bright fringes on the screen?

- A. 0.30 mm
- B. 0.60 mm
- C. 1.2 mm
- D. 2.4 mm

[1]

- 16.** A string of length 0.80 m is fixed at both ends. Waves travel along the string at 240 m s^{-1} . What is the frequency of the second harmonic?

A. 150 Hz
B. 300 Hz
C. 450 Hz
D. 600 Hz

[1]

- 17.** A galaxy moves away from the Earth at a speed of $3.0 \times 10^6 \text{ m s}^{-1}$. The galaxy emits light of wavelength 600 nm. What is the change in wavelength observed on Earth?

A. 6.0 nm
B. 20 nm
C. 60 nm
D. 600 nm

[1]

- 18.** The gravitational field strength at the surface of a planet of radius R is 10 N kg^{-1} . What is the gravitational field strength at a distance $2R$ from the centre of the planet?

A. 2.5 N kg^{-1}
B. 5.0 N kg^{-1}
C. 10 N kg^{-1}
D. 20 N kg^{-1}

[1]

- 19.** A satellite is in a circular orbit of radius r about a planet with orbital speed v . The satellite is moved into a circular orbit of radius $2r$. What is the new orbital speed?

A. $0.50v$
B. $0.71v$
C. $1.4v$
D. $2.0v$

[1]

- 20.** Two point charges of $+2.0\ \mu\text{C}$ and $+3.0\ \mu\text{C}$ are separated by $0.30\ \text{m}$ in a vacuum. What is the magnitude of the electric force between them?

A. $0.060\ \text{N}$
B. $0.20\ \text{N}$
C. $0.30\ \text{N}$
D. $0.60\ \text{N}$

[1]

- 21.** A positively charged particle moves with speed v in a direction parallel to a uniform magnetic field of strength B . What is the magnetic force acting on the particle?

A. Zero
B. qvB , in the direction of motion of the particle
C. qvB , at right angles to the direction of the field
D. qvB , opposite to the direction of motion of the particle

[1]

- 22.** A nucleus of radium-226 ($^{226}_{88}\text{Ra}$) decays by alpha emission to form nuclide X. What are the proton number and the nucleon number of X?

	Proton number of X	Nucleon number of X
A.	88	222
B.	86	226
C.	86	222
D.	84	222

[1]

- 23.** A radioactive nuclide has a half-life of 10 days. The activity of a pure sample of the nuclide is 800 Bq. What is the activity of the sample 30 days later?

- A.** 50 Bq
- B.** 100 Bq
- C.** 200 Bq
- D.** 400 Bq

[1]

24. Two light nuclei undergo a fusion reaction that releases energy. Which is correct about this reaction?

- A.** The binding energy per nucleon of the product is smaller than that of the reactants
- B.** The total mass of the products is greater than the total mass of the reactants
- C.** The total number of nucleons decreases during the reaction
- D.** The binding energy per nucleon of the product is greater than that of the reactants

[1]

25. A star has the same radius as the Sun but twice the surface temperature of the Sun. What is the luminosity of the star relative to that of the Sun?

- A.** 2
- B.** 4
- C.** 8
- D.** 16

[1]

End of examination.

Total: 25 marks