

# A-Level Physics

## Past-Paper Exercise Sheets — Question Index

71 subtopics • 386 questions • 1573 marks

### 1.1 Physical quantities

5 questions, 5 marks • multiple choice x5

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 15 | multiple choice | 1     |
| 9702/12 N25 | 1  | multiple choice | 1     |
| 9702/14 N25 | 1  | multiple choice | 1     |
| 9702/12 J25 | 1  | multiple choice | 1     |
| 9702/14 J25 | 3  | multiple choice | 1     |

### 1.2 SI units

6 questions, 16 marks • multiple choice x5, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 3  | multiple choice | 1     |
| 9702/11 N25 | 22 | multiple choice | 1     |
| 9702/12 N25 | 3  | multiple choice | 1     |
| 9702/22 N25 | 1  | calculation     | 11    |
| 9702/12 J25 | 2  | multiple choice | 1     |
| 9702/12 J25 | 4  | multiple choice | 1     |

### 1.3 Errors and uncertainties

11 questions, 36 marks • multiple choice x9, calculation, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 2  | multiple choice | 1     |
| 9702/12 N25 | 2  | multiple choice | 1     |
| 9702/12 N25 | 4  | multiple choice | 1     |
| 9702/14 N25 | 2  | multiple choice | 1     |
| 9702/14 N25 | 3  | multiple choice | 1     |
| 9702/35 N25 | 2  | calculation     | 20    |
| 9702/11 J25 | 2  | multiple choice | 1     |
| 9702/11 J25 | 3  | multiple choice | 1     |
| 9702/12 J25 | 3  | multiple choice | 1     |
| 9702/12 M25 | 12 | multiple choice | 1     |
| 9702/22 M25 | 1  | short answer    | 7     |

## 1.4 Scalars and vectors

7 questions, 26 marks • multiple choice x5, calculation, short answer

| Source      | Q | Type            | Marks |
|-------------|---|-----------------|-------|
| 9702/11 N25 | 1 | multiple choice | 1     |
| 9702/11 N25 | 4 | multiple choice | 1     |
| 9702/24 N25 | 1 | calculation     | 11    |
| 9702/11 J25 | 1 | multiple choice | 1     |
| 9702/11 J25 | 4 | multiple choice | 1     |
| 9702/14 J25 | 4 | multiple choice | 1     |
| 9702/22 J25 | 1 | short answer    | 10    |

## 2.1 Equations of motion

12 questions, 48 marks • multiple choice x8, calculation x3, short answer

| Source      | Q | Type            | Marks |
|-------------|---|-----------------|-------|
| 9702/11 N25 | 5 | multiple choice | 1     |
| 9702/11 N25 | 6 | multiple choice | 1     |
| 9702/11 N25 | 7 | multiple choice | 1     |
| 9702/12 N25 | 5 | multiple choice | 1     |
| 9702/12 N25 | 6 | multiple choice | 1     |
| 9702/21 N25 | 1 | calculation     | 10    |
| 9702/24 N25 | 1 | calculation     | 11    |
| 9702/11 J25 | 7 | multiple choice | 1     |
| 9702/11 J25 | 8 | multiple choice | 1     |
| 9702/21 J25 | 1 | short answer    | 9     |
| 9702/12 M25 | 4 | multiple choice | 1     |
| 9702/22 M25 | 3 | calculation     | 10    |

## 3.1 Momentum and Newton's laws of motion

11 questions, 20 marks • multiple choice x10, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 11 | multiple choice | 1     |
| 9702/11 N25 | 12 | multiple choice | 1     |
| 9702/12 N25 | 8  | multiple choice | 1     |
| 9702/14 N25 | 8  | multiple choice | 1     |
| 9702/11 J25 | 10 | multiple choice | 1     |
| 9702/11 J25 | 11 | multiple choice | 1     |
| 9702/12 J25 | 9  | multiple choice | 1     |
| 9702/12 J25 | 11 | multiple choice | 1     |
| 9702/13 J25 | 9  | multiple choice | 1     |
| 9702/24 J25 | 2  | short answer    | 10    |
| 9702/12 M25 | 8  | multiple choice | 1     |

### 3.2 Non-uniform motion

8 questions, 26 marks • multiple choice  $\times 6$ , short answer  $\times 2$

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 8  | multiple choice | 1     |
| 9702/12 N25 | 11 | multiple choice | 1     |
| 9702/21 N25 | 2  | short answer    | 12    |
| 9702/11 J25 | 20 | multiple choice | 1     |
| 9702/12 J25 | 12 | multiple choice | 1     |
| 9702/13 J25 | 8  | multiple choice | 1     |
| 9702/14 J25 | 8  | multiple choice | 1     |
| 9702/23 J25 | 3  | short answer    | 8     |

### 3.3 Linear momentum and its conservation

12 questions, 23 marks • multiple choice  $\times 10$ , short answer, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 9  | multiple choice | 1     |
| 9702/11 N25 | 10 | multiple choice | 1     |
| 9702/12 N25 | 9  | multiple choice | 1     |
| 9702/12 N25 | 10 | multiple choice | 1     |
| 9702/12 N25 | 12 | multiple choice | 1     |
| 9702/14 N25 | 10 | multiple choice | 1     |
| 9702/14 N25 | 11 | multiple choice | 1     |
| 9702/11 J25 | 9  | multiple choice | 1     |
| 9702/12 J25 | 10 | multiple choice | 1     |
| 9702/14 J25 | 9  | multiple choice | 1     |
| 9702/23 J25 | 4  | short answer    | 6     |
| 9702/22 M25 | 7  | calculation     | 7     |

### 4.1 Turning effects of forces

11 questions, 35 marks • multiple choice  $\times 8$ , short answer  $\times 3$

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 14 | multiple choice | 1     |
| 9702/12 N25 | 13 | multiple choice | 1     |
| 9702/14 N25 | 14 | multiple choice | 1     |
| 9702/24 N25 | 2  | short answer    | 10    |
| 9702/11 J25 | 13 | multiple choice | 1     |
| 9702/12 J25 | 15 | multiple choice | 1     |
| 9702/12 J25 | 17 | multiple choice | 1     |
| 9702/13 J25 | 12 | multiple choice | 1     |
| 9702/14 J25 | 10 | multiple choice | 1     |
| 9702/22 J25 | 2  | short answer    | 8     |
| 9702/23 J25 | 2  | short answer    | 9     |

## 4.2 Equilibrium of forces

12 questions, 29 marks • multiple choice  $\times 10$ , calculation, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 13 | multiple choice | 1     |
| 9702/12 N25 | 14 | multiple choice | 1     |
| 9702/14 N25 | 13 | multiple choice | 1     |
| 9702/14 N25 | 15 | multiple choice | 1     |
| 9702/22 N25 | 3  | calculation     | 9     |
| 9702/11 J25 | 15 | multiple choice | 1     |
| 9702/13 J25 | 10 | multiple choice | 1     |
| 9702/13 J25 | 14 | multiple choice | 1     |
| 9702/14 J25 | 11 | multiple choice | 1     |
| 9702/12 M25 | 9  | multiple choice | 1     |
| 9702/12 M25 | 11 | multiple choice | 1     |
| 9702/22 M25 | 2  | short answer    | 10    |

## 4.3 Density and pressure

12 questions, 29 marks • multiple choice  $\times 10$ , short answer, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 16 | multiple choice | 1     |
| 9702/12 N25 | 15 | multiple choice | 1     |
| 9702/12 N25 | 16 | multiple choice | 1     |
| 9702/14 N25 | 12 | multiple choice | 1     |
| 9702/21 N25 | 2  | short answer    | 12    |
| 9702/11 J25 | 14 | multiple choice | 1     |
| 9702/11 J25 | 16 | multiple choice | 1     |
| 9702/12 J25 | 14 | multiple choice | 1     |
| 9702/13 J25 | 13 | multiple choice | 1     |
| 9702/14 J25 | 13 | multiple choice | 1     |
| 9702/12 M25 | 10 | multiple choice | 1     |
| 9702/21 N24 | 1  | calculation     | 7     |

## 5.1 Energy conservation

12 questions, 22 marks • multiple choice  $\times 11$ , short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 19 | multiple choice | 1     |
| 9702/12 N25 | 19 | multiple choice | 1     |
| 9702/12 N25 | 20 | multiple choice | 1     |
| 9702/14 N25 | 16 | multiple choice | 1     |
| 9702/14 N25 | 18 | multiple choice | 1     |
| 9702/11 J25 | 18 | multiple choice | 1     |
| 9702/12 J25 | 19 | multiple choice | 1     |
| 9702/12 J25 | 20 | multiple choice | 1     |
| 9702/13 J25 | 17 | multiple choice | 1     |
| 9702/14 J25 | 14 | multiple choice | 1     |
| 9702/14 J25 | 15 | multiple choice | 1     |
| 9702/21 N24 | 3  | short answer    | 11    |

## 5.2 Gravitational potential energy and kinetic energy

12 questions, 22 marks • multiple choice x11, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 17 | multiple choice | 1     |
| 9702/11 N25 | 18 | multiple choice | 1     |
| 9702/12 N25 | 17 | multiple choice | 1     |
| 9702/12 N25 | 18 | multiple choice | 1     |
| 9702/14 N25 | 17 | multiple choice | 1     |
| 9702/14 N25 | 19 | multiple choice | 1     |
| 9702/11 J25 | 17 | multiple choice | 1     |
| 9702/12 J25 | 18 | multiple choice | 1     |
| 9702/13 J25 | 18 | multiple choice | 1     |
| 9702/13 J25 | 19 | multiple choice | 1     |
| 9702/24 J25 | 3  | calculation     | 11    |
| 9702/12 M25 | 15 | multiple choice | 1     |

## 6.1 Stress and strain

10 questions, 18 marks • multiple choice x9, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 21 | multiple choice | 1     |
| 9702/12 N25 | 21 | multiple choice | 1     |
| 9702/12 N25 | 22 | multiple choice | 1     |
| 9702/14 N25 | 20 | multiple choice | 1     |
| 9702/14 N25 | 23 | multiple choice | 1     |
| 9702/21 N25 | 3  | short answer    | 9     |
| 9702/11 J25 | 21 | multiple choice | 1     |
| 9702/11 J25 | 22 | multiple choice | 1     |
| 9702/11 J25 | 23 | multiple choice | 1     |
| 9702/12 J25 | 21 | multiple choice | 1     |

## 6.2 Elastic and plastic behaviour

9 questions, 9 marks • multiple choice x9

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 20 | multiple choice | 1     |
| 9702/11 N25 | 23 | multiple choice | 1     |
| 9702/12 N25 | 23 | multiple choice | 1     |
| 9702/14 N25 | 21 | multiple choice | 1     |
| 9702/12 J25 | 22 | multiple choice | 1     |
| 9702/12 J25 | 23 | multiple choice | 1     |
| 9702/13 J25 | 23 | multiple choice | 1     |
| 9702/14 J25 | 18 | multiple choice | 1     |
| 9702/12 M25 | 19 | multiple choice | 1     |

## 7.1 Progressive waves

10 questions, 22 marks • multiple choice x8, short answer x2

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/12 N25 | 25 | multiple choice | 1     |
| 9702/12 N25 | 26 | multiple choice | 1     |
| 9702/14 N25 | 24 | multiple choice | 1     |
| 9702/11 J25 | 26 | multiple choice | 1     |
| 9702/13 J25 | 24 | multiple choice | 1     |
| 9702/13 J25 | 26 | multiple choice | 1     |
| 9702/14 J25 | 20 | multiple choice | 1     |
| 9702/21 J25 | 5  | short answer    | 6     |
| 9702/22 J25 | 3  | short answer    | 8     |
| 9702/12 M25 | 25 | multiple choice | 1     |

## 7.2 Transverse and longitudinal waves

7 questions, 7 marks • multiple choice x7

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 24 | multiple choice | 1     |
| 9702/11 N25 | 25 | multiple choice | 1     |
| 9702/12 N25 | 24 | multiple choice | 1     |
| 9702/11 J25 | 25 | multiple choice | 1     |
| 9702/12 J25 | 25 | multiple choice | 1     |
| 9702/12 J25 | 28 | multiple choice | 1     |
| 9702/14 J25 | 21 | multiple choice | 1     |

## 7.3 Doppler effect for sound waves

7 questions, 7 marks • multiple choice x7

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 27 | multiple choice | 1     |
| 9702/12 N25 | 27 | multiple choice | 1     |
| 9702/14 N25 | 27 | multiple choice | 1     |
| 9702/11 J25 | 24 | multiple choice | 1     |
| 9702/12 J25 | 26 | multiple choice | 1     |
| 9702/14 J25 | 22 | multiple choice | 1     |
| 9702/12 M25 | 24 | multiple choice | 1     |

## 7.4 Electromagnetic spectrum

*7 questions, 7 marks • multiple choice x7*

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/14 N25 | 25 | multiple choice | 1     |
| 9702/11 J25 | 27 | multiple choice | 1     |
| 9702/12 J25 | 5  | multiple choice | 1     |
| 9702/13 J25 | 27 | multiple choice | 1     |
| 9702/14 J25 | 23 | multiple choice | 1     |
| 9702/12 M25 | 22 | multiple choice | 1     |
| 9702/12 M25 | 23 | multiple choice | 1     |

## 7.5 Polarisation

*8 questions, 15 marks • multiple choice x7, short answer*

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 26 | multiple choice | 1     |
| 9702/14 N25 | 28 | multiple choice | 1     |
| 9702/11 J25 | 28 | multiple choice | 1     |
| 9702/12 J25 | 27 | multiple choice | 1     |
| 9702/13 J25 | 25 | multiple choice | 1     |
| 9702/14 J25 | 24 | multiple choice | 1     |
| 9702/23 J25 | 5  | short answer    | 8     |
| 9702/12 M25 | 26 | multiple choice | 1     |

## 8.1 Stationary waves

*10 questions, 25 marks • multiple choice x8, short answer, long answer*

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 29 | multiple choice | 1     |
| 9702/12 N25 | 30 | multiple choice | 1     |
| 9702/14 N25 | 29 | multiple choice | 1     |
| 9702/24 N25 | 4  | short answer    | 9     |
| 9702/11 J25 | 29 | multiple choice | 1     |
| 9702/11 J25 | 31 | multiple choice | 1     |
| 9702/12 J25 | 24 | multiple choice | 1     |
| 9702/12 J25 | 30 | multiple choice | 1     |
| 9702/14 J25 | 25 | multiple choice | 1     |
| 9702/22 M25 | 4  | long answer     | 8     |

## 8.2 Diffraction

6 questions, 15 marks • multiple choice x5, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/12 N25 | 28 | multiple choice | 1     |
| 9702/14 N25 | 26 | multiple choice | 1     |
| 9702/21 N25 | 4  | short answer    | 10    |
| 9702/13 J25 | 30 | multiple choice | 1     |
| 9702/14 J25 | 26 | multiple choice | 1     |
| 9702/12 M25 | 28 | multiple choice | 1     |

## 8.3 Interference

10 questions, 32 marks • multiple choice x7, long answer, short answer, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 28 | multiple choice | 1     |
| 9702/12 N25 | 31 | multiple choice | 1     |
| 9702/14 N25 | 31 | multiple choice | 1     |
| 9702/22 N25 | 4  | long answer     | 8     |
| 9702/12 J25 | 31 | multiple choice | 1     |
| 9702/13 J25 | 28 | multiple choice | 1     |
| 9702/14 J25 | 27 | multiple choice | 1     |
| 9702/21 J25 | 4  | short answer    | 8     |
| 9702/12 M25 | 27 | multiple choice | 1     |
| 9702/21 N24 | 6  | calculation     | 9     |

## 8.4 The diffraction grating

8 questions, 15 marks • multiple choice x7, short answer



| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 30 | multiple choice | 1     |
| 9702/12 N25 | 29 | multiple choice | 1     |
| 9702/14 N25 | 30 | multiple choice | 1     |
| 9702/11 J25 | 30 | multiple choice | 1     |
| 9702/12 J25 | 29 | multiple choice | 1     |
| 9702/14 J25 | 28 | multiple choice | 1     |
| 9702/23 J25 | 6  | short answer    | 8     |
| 9702/12 M25 | 29 | multiple choice | 1     |

### 9.1 Electric current

8 questions, 20 marks • multiple choice x7, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 32 | multiple choice | 1     |
| 9702/14 N25 | 35 | multiple choice | 1     |
| 9702/12 J25 | 34 | multiple choice | 1     |
| 9702/13 J25 | 4  | multiple choice | 1     |
| 9702/13 J25 | 32 | multiple choice | 1     |
| 9702/14 J25 | 29 | multiple choice | 1     |
| 9702/12 M25 | 30 | multiple choice | 1     |
| 9702/22 M25 | 6  | calculation     | 13    |

### 9.2 Potential difference and power

5 questions, 14 marks • multiple choice x4, short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 31 | multiple choice | 1     |
| 9702/12 N25 | 32 | multiple choice | 1     |
| 9702/11 J25 | 34 | multiple choice | 1     |
| 9702/14 J25 | 30 | multiple choice | 1     |
| 9702/22 J25 | 6  | short answer    | 10    |

### 9.3 Resistance and resistivity

12 questions, 35 marks • multiple choice x9, short answer x2, calculation

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 33 | multiple choice | 1     |
| 9702/12 N25 | 33 | multiple choice | 1     |
| 9702/14 N25 | 32 | multiple choice | 1     |
| 9702/14 N25 | 34 | multiple choice | 1     |
| 9702/24 N25 | 5  | short answer    | 10    |
| 9702/11 J25 | 32 | multiple choice | 1     |
| 9702/11 J25 | 33 | multiple choice | 1     |
| 9702/11 J25 | 35 | multiple choice | 1     |
| 9702/12 J25 | 33 | multiple choice | 1     |
| 9702/13 J25 | 34 | multiple choice | 1     |
| 9702/23 J25 | 7  | calculation     | 8     |
| 9702/24 J25 | 5  | short answer    | 8     |

## 10.1 Practical circuits

*12 questions, 29 marks • multiple choice x10, short answer, calculation*

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 35 | multiple choice | 1     |
| 9702/12 N25 | 34 | multiple choice | 1     |
| 9702/14 N25 | 33 | multiple choice | 1     |
| 9702/14 N25 | 37 | multiple choice | 1     |
| 9702/22 N25 | 5  | short answer    | 11    |
| 9702/11 J25 | 37 | multiple choice | 1     |
| 9702/12 J25 | 35 | multiple choice | 1     |
| 9702/13 J25 | 36 | multiple choice | 1     |
| 9702/14 J25 | 33 | multiple choice | 1     |
| 9702/12 M25 | 34 | multiple choice | 1     |
| 9702/12 M25 | 36 | multiple choice | 1     |
| 9702/21 N24 | 7  | calculation     | 8     |

## 10.2 Kirchhoff's laws

*12 questions, 28 marks • multiple choice x10, short answer, calculation*

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 34 | multiple choice | 1     |
| 9702/11 N25 | 37 | multiple choice | 1     |
| 9702/12 N25 | 37 | multiple choice | 1     |
| 9702/14 N25 | 36 | multiple choice | 1     |
| 9702/21 N25 | 5  | short answer    | 10    |
| 9702/11 J25 | 36 | multiple choice | 1     |
| 9702/12 J25 | 37 | multiple choice | 1     |
| 9702/13 J25 | 35 | multiple choice | 1     |
| 9702/14 J25 | 34 | multiple choice | 1     |
| 9702/14 J25 | 35 | multiple choice | 1     |
| 9702/24 J25 | 6  | calculation     | 8     |
| 9702/12 M25 | 35 | multiple choice | 1     |

### 10.3 Potential dividers

3 questions, 3 marks • multiple choice  $\times 3$

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/12 N25 | 35 | multiple choice | 1     |
| 9702/12 N25 | 36 | multiple choice | 1     |
| 9702/14 J25 | 36 | multiple choice | 1     |

### 11.1 Atoms, nuclei and radiation

12 questions, 42 marks • multiple choice  $\times 8$ , short answer  $\times 4$

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 38 | multiple choice | 1     |
| 9702/11 N25 | 39 | multiple choice | 1     |
| 9702/12 N25 | 39 | multiple choice | 1     |
| 9702/12 N25 | 40 | multiple choice | 1     |
| 9702/14 N25 | 38 | multiple choice | 1     |
| 9702/14 N25 | 39 | multiple choice | 1     |
| 9702/21 N25 | 6  | short answer    | 9     |
| 9702/24 N25 | 6  | short answer    | 10    |
| 9702/11 J25 | 39 | multiple choice | 1     |
| 9702/12 J25 | 38 | multiple choice | 1     |
| 9702/21 J25 | 7  | short answer    | 8     |
| 9702/21 N24 | 5  | short answer    | 7     |

### 11.2 Fundamental particles

11 questions, 19 marks • multiple choice  $\times 10$ , short answer

| Source      | Q  | Type            | Marks |
|-------------|----|-----------------|-------|
| 9702/11 N25 | 40 | multiple choice | 1     |
| 9702/12 N25 | 38 | multiple choice | 1     |
| 9702/14 N25 | 40 | multiple choice | 1     |
| 9702/22 N25 | 6  | short answer    | 9     |
| 9702/11 J25 | 38 | multiple choice | 1     |
| 9702/11 J25 | 40 | multiple choice | 1     |
| 9702/12 J25 | 39 | multiple choice | 1     |
| 9702/12 J25 | 40 | multiple choice | 1     |
| 9702/13 J25 | 33 | multiple choice | 1     |
| 9702/13 J25 | 38 | multiple choice | 1     |
| 9702/13 J25 | 39 | multiple choice | 1     |

### 12.1 Kinematics of uniform circular motion

4 questions, 43 marks • short answer x2, calculation x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 1 | short answer | 15    |
| 9702/42 N25 | 1 | calculation  | 9     |
| 9702/42 J25 | 1 | short answer | 10    |
| 9702/42 M25 | 1 | calculation  | 9     |

### 12.2 Centripetal acceleration

3 questions, 33 marks • calculation x2, short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 1 | short answer | 15    |
| 9702/42 N25 | 1 | calculation  | 9     |
| 9702/42 M25 | 1 | calculation  | 9     |

### 13.1 Gravitational field

2 questions, 20 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 3 | short answer | 9     |
| 9702/44 J25 | 1 | short answer | 11    |

### 13.2 Gravitational force between point masses

2 questions, 18 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 1 | short answer | 9     |
| 9702/43 J25 | 1 | short answer | 9     |

### 13.3 Gravitational field of a point mass

3 questions, 29 marks • short answer x3

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 3 | short answer | 9     |
| 9702/43 J25 | 1 | short answer | 9     |
| 9702/44 J25 | 1 | short answer | 11    |

### 13.4 Gravitational potential

3 questions, 25 marks • short answer x2, calculation

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 1 | short answer | 9     |
| 9702/43 J25 | 1 | short answer | 9     |
| 9702/42 M25 | 2 | calculation  | 7     |

### 14.1 Thermal equilibrium

2 questions, 19 marks • calculation, short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/44 J25 | 2 | calculation  | 7     |
| 9702/42 M25 | 3 | short answer | 12    |

### 14.2 Temperature scales

1 question, 10 marks • calculation

| Source      | Q | Type        | Marks |
|-------------|---|-------------|-------|
| 9702/41 N25 | 4 | calculation | 10    |

### 14.3 Specific heat capacity and specific latent heat

4 questions, 38 marks • short answer x3, calculation

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 3 | short answer | 9     |
| 9702/42 J25 | 3 | short answer | 13    |
| 9702/43 J25 | 3 | short answer | 9     |
| 9702/44 J25 | 2 | calculation  | 7     |

## 15.2 Equation of state

2 questions, 18 marks • short answer, calculation

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 J25 | 4 | short answer | 8     |
| 9702/44 J25 | 3 | calculation  | 10    |

## 15.3 Kinetic theory of gases

2 questions, 16 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 4 | short answer | 8     |
| 9702/43 J25 | 4 | short answer | 8     |

## 16.1 Internal energy

2 questions, 16 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 4 | short answer | 8     |
| 9702/43 J25 | 4 | short answer | 8     |

## 16.2 The first law of thermodynamics

1 question, 8 marks • short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/43 N25 | 2 | short answer | 8     |

## 17.1 Simple harmonic oscillations

6 questions, 57 marks • short answer x4, calculation x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 N25 | 5 | short answer | 10    |
| 9702/44 N25 | 4 | short answer | 10    |
| 9702/42 J25 | 5 | short answer | 9     |
| 9702/43 J25 | 5 | calculation  | 8     |
| 9702/44 J25 | 4 | short answer | 8     |
| 9702/42 M25 | 4 | calculation  | 12    |

## 17.2 Energy in simple harmonic motion

*2 questions, 20 marks • calculation x2*

| Source      | Q | Type        | Marks |
|-------------|---|-------------|-------|
| 9702/43 J25 | 5 | calculation | 8     |
| 9702/42 M25 | 4 | calculation | 12    |

## 17.3 Damped and forced oscillations, resonance

*2 questions, 18 marks • short answer x2*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 N25 | 5 | short answer | 10    |
| 9702/44 J25 | 7 | short answer | 8     |

## 18.2 Uniform electric fields

*2 questions, 22 marks • calculation, short answer*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 J25 | 6 | calculation  | 11    |
| 9702/42 M25 | 6 | short answer | 11    |

## 18.3 Electric force between point charges

*2 questions, 22 marks • short answer, calculation*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 2 | short answer | 11    |
| 9702/43 J25 | 2 | calculation  | 11    |

## 18.4 Electric field of a point charge

*2 questions, 19 marks • long answer, short answer*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/44 N25 | 5 | long answer  | 9     |
| 9702/44 J25 | 5 | short answer | 10    |

## 18.5 Electric potential

3 questions, 29 marks • short answer x2, long answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 5 | short answer | 10    |
| 9702/44 N25 | 5 | long answer  | 9     |
| 9702/44 J25 | 5 | short answer | 10    |

## 19.1 Capacitors and capacitance

2 questions, 20 marks • short answer, calculation

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 6 | short answer | 11    |
| 9702/42 M25 | 5 | calculation  | 9     |

## 19.2 Energy stored in a capacitor

1 question, 11 marks • short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 6 | short answer | 11    |

## 19.3 Discharging a capacitor

1 question, 10 marks • short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 J25 | 7 | short answer | 10    |

## 20.2 Force on a current-carrying conductor

2 questions, 20 marks • short answer, calculation

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/43 J25 | 7 | short answer | 10    |
| 9702/44 J25 | 6 | calculation  | 10    |

## 20.3 Force on a moving charge

2 questions, 21 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/43 J25 | 7 | short answer | 10    |
| 9702/42 M25 | 6 | short answer | 11    |



## 20.5 Electromagnetic induction

3 questions, 28 marks • short answer x3

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 7 | short answer | 11    |
| 9702/44 J25 | 7 | short answer | 8     |
| 9702/42 M25 | 7 | short answer | 9     |

## 21.1 Characteristics of alternating currents

1 question, 8 marks • short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/42 N25 | 7 | short answer | 8     |

## 21.2 Rectification and smoothing

5 questions, 59 marks • calculation x4, short answer

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/44 N25 | 6 | calculation  | 15    |
| 9702/41 J25 | 6 | calculation  | 12    |
| 9702/42 J25 | 8 | calculation  | 10    |
| 9702/43 J25 | 6 | calculation  | 12    |
| 9702/44 J25 | 8 | short answer | 10    |

## 22.1 Energy and momentum of a photon

2 questions, 21 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 N25 | 8 | short answer | 11    |
| 9702/42 M25 | 8 | short answer | 10    |

## 22.2 Photoelectric effect

2 questions, 16 marks • short answer x2

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/44 N25 | 9 | short answer | 8     |
| 9702/42 J25 | 9 | short answer | 8     |

### 22.3 Wave-particle duality

*2 questions, 21 marks • short answer x2*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/41 J25 | 8 | short answer | 13    |
| 9702/44 J25 | 9 | short answer | 8     |

### 22.4 Energy levels in atoms and line spectra

*1 question, 10 marks • long answer*

| Source      | Q | Type        | Marks |
|-------------|---|-------------|-------|
| 9702/42 N25 | 8 | long answer | 10    |

### 23.1 Mass defect and nuclear binding energy

*3 questions, 32 marks • short answer x2, calculation*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/42 N25 | 9  | calculation  | 13    |
| 9702/44 J25 | 11 | short answer | 9     |
| 9702/42 M25 | 9  | short answer | 10    |

### 23.2 Radioactive decay

*4 questions, 44 marks • short answer x4*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/44 N25 | 8  | short answer | 15    |
| 9702/41 J25 | 9  | short answer | 10    |
| 9702/42 J25 | 10 | short answer | 9     |
| 9702/43 J25 | 9  | short answer | 10    |

### 24.1 Production and use of ultrasound

*2 questions, 17 marks • short answer x2*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/41 N25 | 10 | short answer | 8     |
| 9702/44 J25 | 10 | short answer | 9     |

### 24.3 PET scanning

*1 question, 15 marks • short answer*

| Source      | Q | Type         | Marks |
|-------------|---|--------------|-------|
| 9702/44 N25 | 8 | short answer | 15    |

### 25.1 Standard candles

*1 question, 11 marks • short answer*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/42 M25 | 10 | short answer | 11    |

### 25.2 Stellar radii

*2 questions, 20 marks • short answer x2*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/41 J25 | 10 | short answer | 10    |
| 9702/43 J25 | 10 | short answer | 10    |

### 25.3 Hubble's law and the Big Bang theory

*1 question, 10 marks • short answer*

| Source      | Q  | Type         | Marks |
|-------------|----|--------------|-------|
| 9702/41 J25 | 10 | short answer | 10    |