



# r/IGCSE Resources

Practice Papers for Cambridge IGCSE™

## **Physics (0625/0972)**

Extended tier

Your name: .....

by the r/IGCSE Physics Helper team

1<sup>st</sup> edition, for examination until 2025

# Foreword

Dear reader,

This booklet contains a set of Practice papers specifically designed for the Cambridge IGCSE™ Physics (0625/0972) - Extended tier syllabus for the new **2023 syllabus**.

This booklet also contains the mark scheme for the practice papers.

As per the IGCSE™ Physics (0625/0972) syllabus published by Cambridge Assessment International Education, the syllabus culminates in the IGCSE examination, with assessment being in the form of three of the four examination papers, which are as follows:

Extended tier:

- Paper 2 (Multiple Choice Questions) - 40 marks in total
- Paper 4 (Structured Questions) - 80 marks in total
- Paper 5 (practical) - 40 marks in total
- Paper 6 (Alternative to practical) - 40 marks in total

This booklet follows the syllabus and paper structure with the set of practice papers developed by skilled alumni of the subject. This booklet has been produced by the r/IGCSE Physics Subject Helper Team, assisted by a few alumnus of the subject.

Due to the nature of paper 5 and 6, we did not have enough helpers willing to set papers for these components. Therefore, we are unable to provide papers for these components at this stage. However, if we receive other helpers willing to make papers for these components, we will update this booklet.

The practice papers and its associated mark schemes have been designed in the style of the questions and mark schemes used by the examination board.

We wish all candidates the best of luck in their examinations, and we hope that this booklet helps you in your journey to academic success in your future!

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## Paper 2 (Multiple-Choice Questions)

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*This paper resembles the typical questions asked in a Paper 2 for IGCSE Physics.*

**TIME ALLOWED:** 45 minutes

**TOTAL MARKS:** 40

**ADDITIONAL MATERIALS NEEDED:** Ruler and Protractor

### **INSTRUCTIONS**

- There are forty questions on this paper.
- Answer **all** questions.
- For each question there are four possible answers **A, B, C** and **D**.
- Choose the one you consider correct and record your choice in soft pencil on the multiple-choice answer sheet.

### **INFORMATION**

- Follow the instructions on the multiple-choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple-choice answer sheet in the spaces provided unless this has been done for you.
- You may use a calculator.
- Take the weight of 1.0kg to be 9.8N (acceleration of free fall =  $9.8 \text{ m/s}^2$ )

- 1 Which person is accelerating?
- A A sky diver falling towards the moon surface
  - B A passenger in a train that is stationary
  - C a sky diver falling at terminal velocity towards the earth surface
  - D a driver of a car that is moving at constant speed

- 2 Which word completes the statement below.

Mass is a measure of .....

- A Inertia
  - B Weight
  - C Speed
  - D Voltage
- 3 Which list contains both vector and scalar quantities?
- A velocity, force, acceleration.
  - B mass, length, time.
  - C energy, power, current.
  - D displacement, momentum, temperature.

- 4 The diagram below shows a meter rule in equilibrium.

At what point does the center of mass act?



**5** Which pair has valid units for momentum

- A** N s and Kg m/s<sup>2</sup>
- B** N s and Kg m/s
- C** N/s and Kg m/s<sup>2</sup>
- D** N/s and Kg m/s

**6** A car is driving on a motorway and uses up fuel as it drives.

What happens to the mass and weight of the car?

- A** They both change
- B** They both stay the same
- C** Mass stays the same but weight changes
- D** Mass changes but weight stays the same

**7** A person accidentally drops a toy of unknown mass, from the fifth floor of a building to ground floor.

Which equation can be used to calculate the speed at which the toy drops?

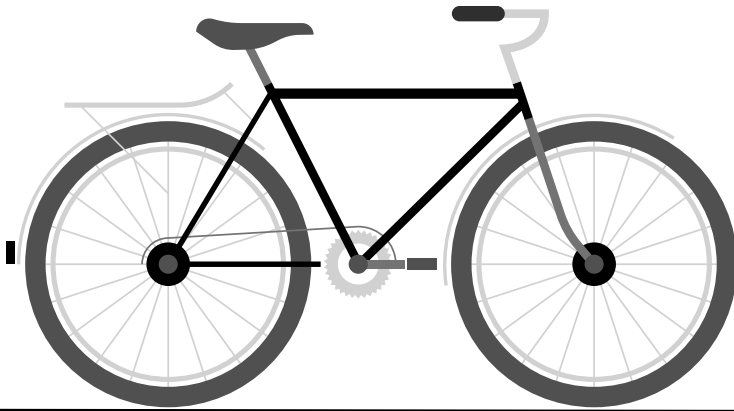
- A**  $v^2 = h$
- B**  $E_k = 0.5mv^2$
- C**  $s = d t$
- D**  $2h = v^2$

- 8** A man has a mass of 85 kg.

What is the weight of the man?

- A** 850 N
  - B** 85 kg
  - C** 833 N
  - D** 400 N
- 9** Calculate the spring constant of a spring that has a mass of 0.2 kg and accelerates at  $0.6 \text{ m/s}^2$  when it is extended by 5 cm.
- A** 0.024 N/m
  - B** 2.4 N/m
  - C** 4.8 N/m
  - D** 0.24 N/m

**10** A bike accelerates uniformly along a straight, horizontal road.



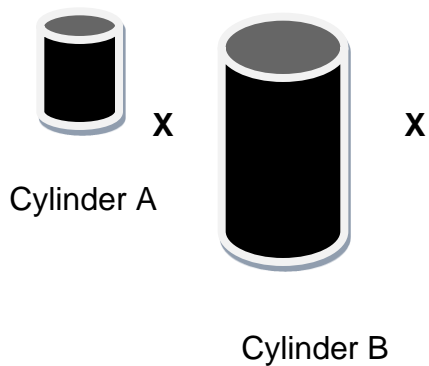
The speed of the bike increases from rest to 8 m/s in 25s.

Calculate the distance travelled by the bike in this time.

- A** 32 m
- B** 200 m
- C** 100 m
- D** 50 m



**11** Two transparent cylinders filled with water are shown below.



What is the difference between cylinder A and cylinder B in the pressure exerted by the water at point **X**?

- A** 0.0 Pa
  - B** 0.3 Pa
  - C** 0.5 Pa
  - D** - 0.5 Pa
- 12** During sunlight, dust particles are seen moving randomly.
- What is the cause of this random motion?
- A** Dust particles heating up due to radiation emitted by the sun.
  - B** Dust particles evaporating because they are heating up due to radiation emitted by the sun.
  - C** The collisions between dust particles and air molecules.
  - D** The attraction between dust particles and air molecules.
- 13** Which material is best suited to make the handle of a cooking pan.
- A** Wood
  - B** Copper
  - C** Iron
  - D** Glass

- 14** Which statement correctly describes the reason why there is a shortage of water during draught?
- A** During draughts, warmer temperatures cause more water to evaporate from open water bodies.
  - B** During draughts, colder temperatures cause more water to freeze.
  - C** During draughts, it is windy, which increases the rate of evaporation.
  - D** During draughts, the lack of wind causes water to evaporate.

- 15** During a camp, several students organized a bonfire.

They kept their hands near the fire to warm their hands.

What is the method by which the heat is transferred?

- A** Conduction
  - B** Convection
  - C** Radiation
  - D** None of the above
- 16** A piston contains  $3400 \text{ cm}^3$  of gas. The pressure of this gas is  $0.9 \times 10^5 \text{ Pa}$ .
- The piston is now moved so that there is a pressure is  $2.5 \times 10^5 \text{ Pa}$ .
- A student uses Boyle's law to calculate that there is  $1200 \text{ cm}^3$  of gas when the piston is moved.
- Which statement explains why there is less than  $1200 \text{ cm}^3$  of gas at this point?
- A** The rate of change of the resultant force was not constant when the piston was moved.
  - B** The rate of change of temperature was not constant when the piston was moved.
  - C** The density of the gas was not constant.
  - D** The temperature was not constant when the piston was moved.

**17** It takes 400 MW of power to boil 1 kg at 100 °C.

The specific latent heat of vaporisation is 2260 J/g.

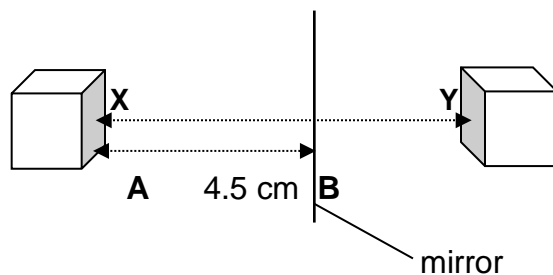
How much time does it take to boil the water?

- A** 5.65 s
- B**  $5.65 \times 10^{-3}$  s
- C** 177 s
- D** 0.177 s

**18** Calculate the difference between the minimum and maximum distance that a human can hear.

- A** 15000 m
- B** 15000 km
- C** 19980 m
- D** 30000000 m

**19** An object mirror is next to mirror as shown below.



What is distance XY?

- A** 4.5 cm
- B** 9 cm
- C** 13.5 cm
- D** 10 cm

- 20** A red monochromatic light travels at a speed of  $k \times 10^9$  m/s when it is refracted from air into a glass.

The critical angle of this glass is 53 degrees.

Find the value of  $k$ .

- A** 2.4
- B** 0.24
- C** 0.38
- D** 3.8

- 21** Waves transfer energy without transferring .....

What is the missing word that completes the sentence above?

- A** Matter
- B** Light
- C** Atoms
- D** Electrons

- 22** Which option best describes the application in which converging lens are used?

- A** Food manufacturing
- B** Spectacles
- C** Windows
- D** Blankets

**23** Why do cell phones use microwaves to communicate rather than radio waves?

- A** Microwaves can penetrate through some walls
- B** Microwaves travel faster than radio waves
- C** Microwaves have more frequency than radio waves
- D** Microwaves can travel to a bigger range than radio waves

**24** The incidence angle of a ray approaching a glass is  $35^\circ$ .

The glass has a refractive index of 1.5.

What is the angle of refraction of the ray?

- A**  $22.5^\circ$
- B**  $59^\circ$
- C**  $35^\circ$
- D**  $45^\circ$

**25** Which table correctly shows the truth table for OR gate?

**A**

Input 1	Input 2	Output
0	0	1
1	0	1
0	1	1
1	1	0

**C**

Input 1	Input 2	Output
0	0	0
1	0	1
0	1	1
1	1	0

**B**

Input 1	Input 2	Output
0	0	0
1	0	1
0	1	1
1	1	1

**D**

Input 1	Input 2	Output
0	0	0
1	0	0
0	1	0
1	1	1

**26** Which of the following factors does **not** affect the e.m.f induced due to the magnetic field produced inside an a.c. generator?

- A** The strength of the magnetic field
- B** Number of turns in the coil
- C** The rate of rotation of the coil
- D** The potential difference across the coils.

**27** Wire A has a resistance of  $5\ \Omega$ .

Wire B is made when the length of Wire A is extended by 4 times.

Wire C is made by reducing the area of Wire B by 2 times.

What is the resistance of wire C?

- A**  $20\ \Omega$
- B**  $10\ \Omega$
- C**  $40\ \Omega$
- D**  $80\ \Omega$

**28** The currents of  $4.0\ \text{A}$  and  $3.0\ \text{A}$  enter a junction in a circuit.

There is no other current entering the junction.

What is the total current leaving the junction?

- A**  $7.0\ \text{A}$
- B**  $1.7\ \text{A}$
- C**  $1.0\ \text{A}$
- D**  $3.5\ \text{A}$

**29** Which metal is used to make the core of a transformer?

- A** Iron
- B** Aluminum
- C** Steel
- D** Platinum

**30** A 100 % efficient transformer has a current of 4 A and voltage of 5 V in its primary coil.

What is current of the transformer in the secondary coil if the secondary coil has a voltage of 40 V?

- A** 50 A
- B** 5 A
- C** 0.5 A
- D** 0.05 A

**31** A parallel circuit consists of two resistors, each of 4  $\Omega$  in different 'loops' of the circuit.

What is the total resistance of the circuit?

- A** 8.0  $\Omega$
- B** 0.5  $\Omega$
- C** 2.0  $\Omega$
- D** 4.0  $\Omega$

**32** A nucleus consists of 4 neutrons and 5 protons.

How many nucleons does it have?

**A** 9

**B** 1

**C** 4

**D** 5

**33** Which statement is **not** a conclusion Rutherford made about the atom through the scattering of alpha particles through a thin sheet of gold?

**A** An atom has a very small nucleus surrounded by mostly empty space.

**B** An atom has a nucleus that is positively charged

**C** The nucleus contains most of the mass of the atom

**D** There are same number of electrons orbiting the nucleus as there are protons.

**34** What is the name of the process when two nuclei join together?

**A** Nuclear Fusion

**B** Nuclear Fission

**C** Radioactive Decay

**D** Background Radiation

**35** Which statement explain an atom may be radioactive?

**A** It has too many neutrons

**B** It has too many nucleons

**C** It has too many protons

**D** It has too many electrons



**36** How long does it take for moon to orbit the earth?

- A** 23 days
- B** 1 month
- C** 1 year
- D** 23 years

**37** How long are two light years?

- A**  $9.5 \times 10^{28}$  m
- B**  $1.9 \times 10^{16}$  m
- C**  $1.9 \times 10^{15}$  m
- D**  $9.5 \times 10^{15}$  m

**38** Which of the following statements are incorrect about the formation of a star?

- A** A star is formed from interstellar clouds of gas and dust that contain hydrogen.
- B** A red giant from a less massive star forms a planetary nebula with a white dwarf star at its centre.
- C** A protostar becomes a stable star when the inward force of gravitational attraction is balanced by an outward force due to the high temperature in the centre of the star.
- D** The nebula from a supernova cannot form any new stars with orbiting planets.

**39** Phobos is a moon that orbits Mars.

It has an orbital speed of 2100 m/s and an orbital period of just 7 hours and 39 minutes.

Calculate the average radius of the orbit Phobos takes.

**A**  $9.2 \times 10^6$  m

**B**  $1.5 \times 10^6$  m

**C**  $1.7 \times 10^6$  m

**D**  $2.6 \times 10^6$  m

**40** The table below shows some data about different objects in our universe.

Object	Description
Tempel 1	An object that orbits the sun in an elliptical path
Pluto	A dwarf planet
Andromeda	A large collection that consists of billions of stars
Puck	A moon that orbits Uranus

Which object is a galaxy?

**A** Tempel 1

**B** Pluto

**C** Andromeda

**D** Puck

## PAPER 2

**Candidate Name:** \_\_\_\_\_

**Component Score:**                      **/40**    **Component Grade:**

**Percentage:**                                      **%**

### Multiple-choice Answer Sheet

### Instructions

**Use a soft pencil (B or HB)**

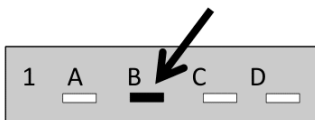
Shade ONE letter only for each question.

Example:

For question 1,

If you think B is the right answer,

Fill in your answer sheet like this:



Make sure you put your answer in line with the correct question number.

Rub out any answer you wish to change.

1	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
2	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
3	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
4	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
5	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
6	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
7	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
8	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
9	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
10	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
11	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
12	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
13	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
14	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
15	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
16	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
17	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
18	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
19	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
20	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D

21	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
22	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
23	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
24	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
25	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
26	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
27	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
28	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
29	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
30	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
31	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
32	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
33	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
34	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
35	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
36	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
37	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
38	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
39	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
40	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D

## Mark Scheme

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

<b>27</b>	C
<b>28</b>	A
<b>29</b>	A
<b>30</b>	C
<b>31</b>	C
<b>32</b>	A
<b>33</b>	D
<b>34</b>	A
<b>35</b>	A
<b>36</b>	B
<b>37</b>	B
<b>38</b>	D
<b>39</b>	A
<b>40</b>	C

## Paper 4 (Structured questions)

---

*This paper resembles the typical questions asked in a Paper 4 for IGCSE Physics*

**TIME ALLOWED:** 1 hour 15 minutes

**TOTAL MARKS:** 80

**ADDITIONAL MATERIALS NEEDED:** Ruler and Protractor

### **INSTRUCTIONS**

- Write your name in the space available at the top of the paper.
- Answer **all** the questions.
- Write answers in the spaces provided.
- The use of calculator is allowed.
- Use a blue or black pen to answer questions. The use of HB pencils is allowed for diagrams.
- You are reminded of having clear presentation and legible handwriting in your answers.
- You must show all your workings and use units correctly to gain full marks.
- Take the weight of 1.0kg to be 9.8N (acceleration of free fall =  $9.8 \text{ m/s}^2$ )

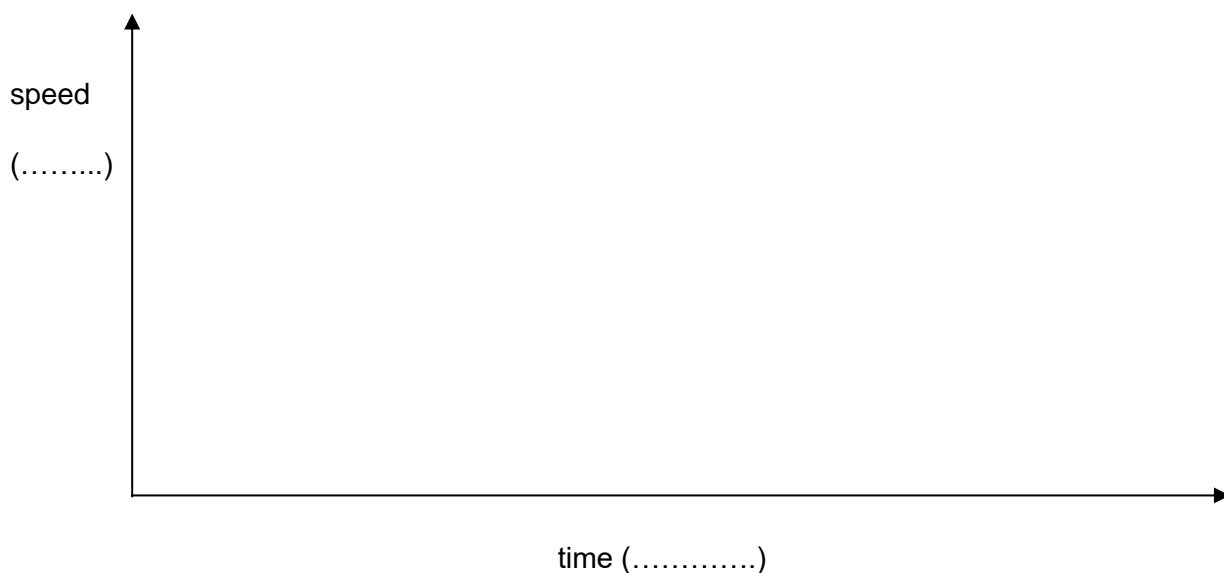
- 1 (a) Audrey kayaks to a speed of 4 km/h from rest in 6 minutes.

The velocity of her kayak increases at a constant rate in this time.

Then, she kayaks at this speed of 4 km/h for a time of  $t$  minutes.

After this time, she decelerates back to rest in 12 minutes at a constant rate.

Sketch the speed time graph for the motion of her kayak, clearly labelling the time values in terms of  $t$  and any important speed values.



[4]

- (b) She kayaks for 1 500 m in this journey.

Calculate the total time that takes.

.....

[4]

[Total: 8]

2 (a) State the principle of conservation of energy.

.....

.....

.....

[2]

(b) A ball of mass 75 g falls down a cliff that is 12 m high.

(i) Calculate the gravitational potential energy of the ball.

..... J [2]

(ii) The ball has a kinetic energy of 7.7 J when it reaches the ground.

Calculate how much energy was lost to other sources when it fell.

..... J [1]

[Total: 5]



**3** An ice cube has a density of  $0.90 \text{ g/cm}^3$ .

It has a mass of  $100 \text{ g}$  and a volume of  $5 \text{ cm}^3$ .

**(a)** Calculate the length of each side of the ice cube.

.....

[4]

**(b)** The ice cube has a specific heat capacity of  $2100 \text{ J/Kg } ^\circ\text{C}$

Calculate the energy required to change the temperature of ice by  $1 \text{ degree Celsius}$ .

.....

[2]

**(c)** Calculate the thermal capacity of the ice cube.

.....

[2]

[Total: 8]

- 4 (a) Give **two** examples where a thermocouple thermometer is used rather than liquid in glass thermometer.

1 .....

2 .....

[2]

- (b) Define the following terms in relation to a thermometer:

(i) *range*,

.....

.....

(ii) *sensitivity*.

.....

.....

[2]

- (b) State and explain **two** factors that affect the sensitivity of liquid in glass thermometer.

Factor 1 .....

.....

Explanation .....

.....

Factor 2 .....

.....

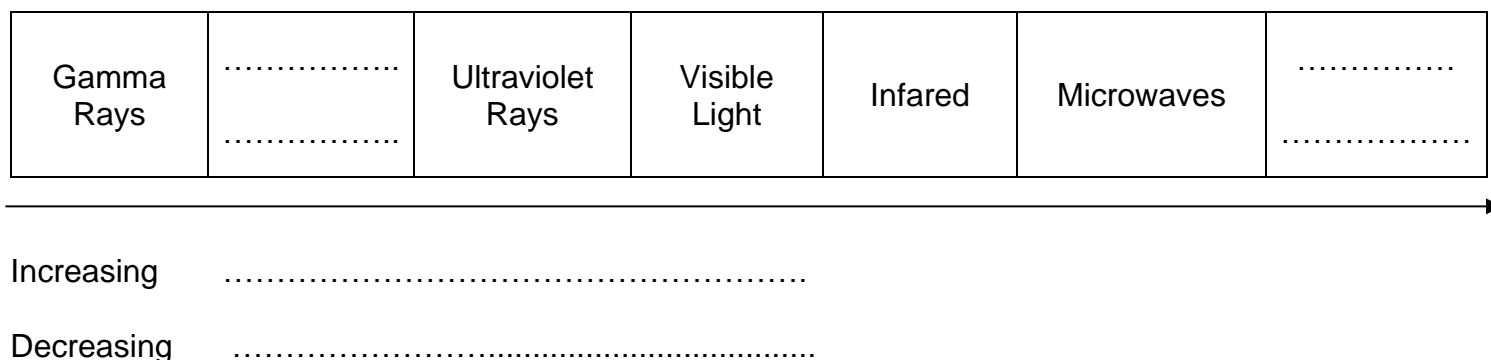
Explanation .....

.....

[4]

[Total: 8]

5 Fig. 5.1 shows the electromagnetic spectrum.



**Fig. 5.1**

**(a)** Complete the missing labels in Fig. 5.1. [4]

**(b)** Ultraviolet rays have a speed of  $k \times 10^6$  m/s.

Find the value of  $k$ .

$k =$  .....

[1]

**(c) (i)** State a section of the spectrum that is used in medical applications.

.....

[1]

**(ii)** State a section of the spectrum that is used for thermal imaging.

.....

[1]

**(d)** State and explain the use of optical fibers in telecommunications.

.....

.....

.....

.....

[3]

[Total: 10]

6 (a) State which type of sound wave has a frequency of 42 000 Hz.

Explain your answer.

.....  
.....

[2]

(b) State the speed of sound in a:

(i) Lemonade, .....

(ii) Iron block. ....

[2]

(c) A sound wave is diffracted through an open door.

State how the following factors affect the diffraction of the wave.

(i) *Width of the gap made when the door opens*

.....  
.....

[1]

(ii) *Wavelength of the sound*

.....  
.....

[1]

(d) Using your answer from (b) (i), calculate the wavelength of the sound that has a frequency of 30 Hz in the lemonade.

..... [2]

[Total: 8]

- 7** A component in a circuit that obeys ohm's law receives a current of  $c$  A and a voltage of 14 V.  
It receives a power of 56 W.

**(a)** Calculate the resistance it has.

$$R = \dots\dots\dots \Omega \text{ [4]}$$

**(b)** Calculate the number of electrons that flow in this component during 2 minutes of its operation.

The elementary charge,  $e$ , is  $1.6 \times 10^{-19}$ .

$$\dots\dots\dots [3]$$

**(c)** Another component receives a voltage of 6 V.

The circuit consists of these two components only and is connected in series.

Calculate the electromotive force that the battery provides.

$$\dots\dots\dots [1]$$

**(d)** A transformer can be a component of an electrical circuit.

Draw the circuit symbol for a transformer.

$$[1]$$

[Total: 8]

**8** This question is about electrical fields.

**(a)** State what is meant by *electric field*.

.....  
.....

[1]

**(b)** Complete the following statements.

A positively charged object ..... to another positively charged object.

A negatively charged object ..... to another positively charged object.

[2]

**(c)** A student tries to clean a plastic rod using a woolen cloth.

In terms of particles, explain how the rod becomes negatively charged.

.....  
.....  
.....

[2]

**(d)** Another rod is positively charged.

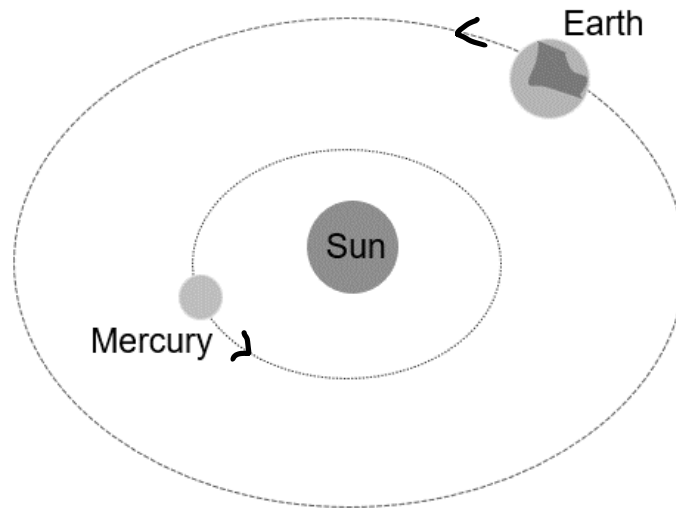
Explain how this rod can attract a piece of aluminum foil.

.....  
.....  
.....  
.....  
.....

[3]

[Total: 8]

9 Earth and Mercury are two planets in our solar system.



(a) Give **two** ways in which the orbits of earth and mercury are similar.

- 1 .....  
.....
- 2 .....  
.....

[2]

(b) Give **two** ways in which the orbits of earth and mercury are different.

- 1 .....  
.....
- 2 .....  
.....

[2]

**(c)** Moon **A** orbits Saturn and Moon **B** orbits Mars.

Moon **A** and Moon **B** have a similar orbital period, but Moon **A** has an orbital speed of  $10y$  m/s and moon **B** has an orbital speed of  $y$  m/s.

Explain why.

.....

.....

.....

.....

[2]

**(d)** Explain why there is a chance that a planet and a comet can collide in our solar system.

.....

.....

.....

[2]

[Total: 8]



**10 (a)** State what is meant by

**(i)** *half-life*,

.....  
.....

**(ii)** *radioactive decay*,

.....  
.....

**(iii)** *isotope*.

.....  
.....

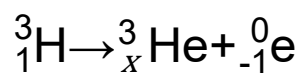
[3]

**(b)** State the nature of an alpha particle.

.....  
.....

[1]

**(c)** A decay equation is shown below.



$x =$  .....

[1]

**(d)** A radioactive element contains  $6.9 \times 10^{42}$  atoms. It has a half-life of 13 hours.

Calculate the number of atoms of this sample that decay in the following 52 hours.

number = .....

[3]

[Total: 8]

**Marker/Assessor's use only:**

<b>Question Number</b>	<b>Mark Scored</b>
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	
<b>6</b>	
<b>7</b>	
<b>8</b>	
<b>9</b>	
<b>10</b>	
<b>Total (out of 80)</b>	
<b>Percentage</b>	
<b>Component grade</b>	

## Mark Scheme

Question	Answer	Marks
1 (a)	Values and units correctly labelled	B1
	Straight line with positive gradient going from 0 km/h to 4 km/h <b>or</b> equivalent with other units chosen	B1
	Horizontal line from 6 to 6+t <b>or</b> equivalent with other units chosen	B1
	Straight line with negative gradient going back to (0,18+t) <b>or</b> equivalent with other units chosen	B1
	Graph should look like this:   <b>NOT TO SCALE</b>	
1 (b)	Distance = Area under the graph	B1
	Finding correct expression in terms of $t$ eg. $1.5 = \frac{0.5(18+t)(4)}{60}$	M1
	$t = 18$ s	A1
	Total time = 36 s	A1 (FT)
<b>Total</b>		<b>8</b>


Question	Answer	Marks
2 (a)	Energy is never created or destroyed	B1
	Energy can only be transformed.	B1
2 (b) (i)	$E = m g h$	C1
	$E = 8.8$ J	A1
2 (b) (ii)	1.1 J	A1 (FT)
<b>Total</b>		<b>5</b>

Question	Answer	Marks
<b>3 (a)</b>	Density = mass/volume	<b>C1</b>
	$x = 0.022$ (correct method to calculate x)	<b>M1</b>
	Volume = $5 \times 0.022 = 0.11$	<b>A1</b>
	Length of each side = 0.48 cm	<b>A1</b>
<b>3 (b)</b>	$E = m c \Delta T$	<b>C1</b>
	$E = 210 \text{ J}$	<b>A1</b>
<b>3 (c)</b>	Thermal capacity = mass $\times$ density	<b>C1</b>
	$0.09 \text{ J / } ^\circ\text{C}$	<b>A1</b>
<b>Total</b>		<b>8</b>

Question	Answer	Marks
4 (a)	Any <b>two</b> correct applications mentioned such as:  Measuring temperature of different colours of flames produced during a flame test  To measure temperature of iron produced inside a blast furnace  <b>B1</b> for each correct application mentioned	2
4 (b)	<b>B1</b> for each correct definition  <b>Sensitivity</b> – How easy it to detect small changes in temperature.  <b>Range</b> – The lowest and highest temperatures the thermometer can measure.	2
4 (c)	Correct factors affecting the sensitivity mentioned ( <b>B1</b> ) + correct explanation ( <b>B1</b> ) for each pair  (max 2 pairs)  <b>Factor:</b> Using a thermometer with a larger glass bulb  <b>Explanation:</b> larger bulb contains more liquid and therefore, allows for a larger change in the level of the liquid in the tube  <b>Factor:</b> The diameter of the capillary tube  <b>Explanation:</b> Using a narrow tube will lead to small changes in volume results in the liquid moving a larger distance along the tube  <b>Factor:</b> Using a glass bulb with a thinner wall  <b>Explanation:</b> heat can be transferred to the bulb more easily and a small change in temperature can be more easily detected	4
<b>Total</b>		<b>8</b>

Question	Answer						Marks							
5 (a)	<table><tr><td>Gamma Rays</td><td>X Rays ..... (B1).....</td><td>Ultraviolet Rays</td><td>Visible Light</td><td>Infrared .....</td><td>Microwaves</td><td>Radio waves ..... (B1).....</td></tr></table>						Gamma Rays	X Rays ..... (B1).....	Ultraviolet Rays	Visible Light	Infrared .....	Microwaves	Radio waves ..... (B1).....	
	Gamma Rays	X Rays ..... (B1).....	Ultraviolet Rays	Visible Light	Infrared .....	Microwaves	Radio waves ..... (B1).....							
	<div><div></div></div>													
	Increasing ..... wavelength (B1) .....													
Decreasing ..... frequency (B1) .....														
							B4							
5 (b)	$k = 300$						A1							
5 (c) (i)	X rays or Gamma rays						A1							
5 (c) (ii)	Infrared radiation						A1							
5 (d)	They are used to transmit signals over long distanced						B1							
	They send information over fibre by turning electronic signals into light						B1							
Total						9								

Question	Answer	Marks
6 (a)	Ultrasound	<b>A1</b>
	It has frequency that is bigger than 20 kHz	<b>B1</b>
6 (b) (i)	1500 m/s (allow 1000 – 2500 m/s)	<b>A1</b>
6 (b) (ii)	5100 m/s (allow 3000 – 7000 m/s)	<b>A1</b>
6 (c) (i)	Size of the gap is inversely proportional to the effect of the diffraction (spreading out of waves)	<b>B1</b>
6 (c) (ii)	Lower wavelength means higher frequency (Wavelength and frequency of the wave is inversely proportional)	<b>B1</b>
6 (d)	$v = f \lambda$	<b>C1</b>
	50 m	<b>B1 (FT)</b>
<b>Total</b>		<b>8</b>

Question	Answer	Marks
7 (a)	$P = IV$	C1
	$c = 4 \text{ A}$	A1
	$P = I^2 R$	C1
	$R = 3.5 \Omega$	A1
7 (b)	$Q = It$	C1
	Number of electrons = $480 \div 1.6 \times 10^{-19}$ allow FT	M1
	$3.0 \times 10^{21}$ (electrons)	A1
7 (c)	20 V	A1
7 (d)		A1
Total		8

Question	Answer	Marks
8 (a)	A region in which an electrical charge experiences a force	B1
8 (b)	A positively charged object <u>repels</u> to another positively charged object.	A1
	A negatively charged object <u>attracts</u> to another positively charged object.	A1
8 (c)	Electrons mentioned	B1
	negative charges / electrons move from cloth <b>or</b> move to rod	B1
8 (d)	When the foil is held close to the positively charged rod, the electrons in the foil move away from the positive charge on the foil	B1
	This causes the top of aluminum foil to be negatively charged.	B1
	Negatively charged objects attracts to positively charged objects, so the foil attracts to the rod.	B1
Total		8



Question	Answer	Marks
<b>9 (a)</b>	Any <b>two</b> from:  Mercury orbits closer to the Sun.  Earth travels more distance in its orbit  Mercury's orbit is more elliptical  Mercury travels much faster than earth  Earth takes longer to complete an orbit  Ora	<b>B2</b>
<b>9 (b)</b>	Any <b>two</b> from:  Distance from earth to sun constant but comet/mercury's distance changes  Speed from earth to sun constant but comet/mercury's distance changes  The sun is more centralised for Earth's orbit  Mercury/comet and Earth have different planes of orbit  Comet/Mercury travels a larger distance in its orbit  Ora	<b>B2</b>
<b>9 (c)</b>	The orbital radii of the two moons are different  Orbit radius of moon A is (10 times) bigger than moon B  <b>B1</b> each for statement/idea mentioned in the explanation	<b>B2</b>
<b>9 (d)</b>	Any <b>two</b> from:  Orbits of a planet and comet can intersect or overlap  A comet and a planet can be at the same place at the same time  The orbit periods of a comet and planet can be different	<b>B2</b>
<b>Total marks</b>		<b>8</b>

Question	Answer	Marks
10 (a) (i)	the time it takes for the radioactivity to fall by half.	B1
10 (a) (ii)	The breaking up of the nucleus	B1
10 (a) (iii)	Isotopes are atoms of the same element that have an equal number of protons but a different number of neutrons.	B1
10 (b)	Any relevant property stated about alpha particle such as: It is helium nuclei ( <b>not</b> nucleus)	B1
10 (c)	2	A1
10 (d)	52 hours = 4 half lives <b>or</b> evidence of halving 4 times (seen or implied)	B1
	Number left = $4.3 \times 10^{41}$	A1
	Number decayed = Total – Number left = $6.9 \times 10^{42} - 4.3 \times 10^{41} = 6.5 \times 10^{42}$ atoms	A1
Total		8

## Grade Threshold (estimated)

Paper	Max. Marks	A	B	C	D	E	F	G
02	40	26	22	16	15	13	11	9
04	80	53	43	34	28	22	15	11

Grade A\* does not exist for a component.

### Overall thresholds

Minimum mark (out of 200) after component weightings for grade:

A*	A	B	C	D	E	F	G
155	131	109	84	73	59	44	34

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Please note that this threshold is predicted and set by skilled alumni of the subject rather than on the data of the candidates giving the exams. Hence, accuracy of the threshold is not 100 % but reasonable estimates are made to reflect the thresholds in 2023 on the information given by the exam board.

Also, since we were unable to make a paper 5 or 6, we have used the weightings of paper 2 and 4 to estimate the overall threshold.

For example:

The overall threshold for an A grade was set as follows.

Paper 2: Mark  $\times$  weighing factor =  $26 \times 1.5 = 39$

Paper 4: Mark  $\times$  weighing factor =  $53 \times 1.25 = 66.25$

### Total

$(105 \text{ [Total mark of } 105.25 \text{ rounded down]} / 160) \times 200 = 131.25$

[Threshold rounded down to 131]



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## Acknowledgements and Information:

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