PHYSICS · Practice paper

Physics Exam-Style Paper 1

NAME _____

DATE _____

QUESTIONS
36

TOTAL MARKS
114

SUGGESTED TIME
125 minutes

MARK SCHEME
Free at subjectcover.com

Instructions

Answer all questions in the spaces provided or on lined paper. Show your working — you can earn marks for your method even if the final answer is wrong. Number each answer clearly.

1. A cyclist rides a bike along a straight road. At one point, the cyclist stops at a traffic light for 20 s, then cycles away at a steady speed for the next 60 s. [5 marks]

(a) Complete the table to show which of the following are scalar and which are vector quantities: speed, displacement, time, velocity. [2]

Scalar or vector:

Quantity	Type (Scalar or Vector)
Speed	
Displacement	
Time	
Velocity	

(b) State the SI units for (i) speed and (ii) time. [1]

(c) Explain the difference between speed and velocity. [2]

2. Write the equation linking acceleration, initial velocity, final velocity, and time. [1 mark]

3. Which of the following best describes direct current (d.c.)? [1 mark]

A A current that constantly changes direction and size.

B A current that is always in the same direction with a constant value.

C A current that is always zero.

D A current that reverses direction every second.

4. A ray of light passes from air into water at an angle of incidence of 35°. The angle of refraction inside the water is measured as 22°. [4 marks]

(a) Calculate the refractive index of water. Show your working clearly. [2]

(b) Write down the equation relating angle of incidence and angle of refraction to refractive index. [1]

(c) Explain, in terms of wave speed, why refraction occurs when light passes from air into water. [1]

5. Optical fibres use total internal reflection to transmit light signals, and sound waves can also be used in medicine. [4 marks]

(a) Explain how total internal reflection allows light to travel through an optical fibre without escaping. [2]

(b) Doctors use optical fibres in endoscopes to see inside the body. State one reason why this is better than traditional surgery. Give one way sound is used in medicine. [2]

6. State two different applications for optical fibres. For each, give a reason why optical fibres are a suitable choice. [2 marks]

7. Solar heating panels are used to heat water in some homes. [4 marks]

(a) Name the main process by which energy from the Sun reaches the panels. [1]

(b) State what colour and finish (shiny/dull) is best for the surface of the panel for maximum absorption of energy. Give a reason. [2]

(c) Explain how the water inside is heated using energy from the Sun. [1]

8. To cope with a sudden cold snap, a country's electricity demand rises quickly in one evening. [4 marks]

(a) Name one type of power station that can respond quickly to sudden changes in demand, and one type that cannot. [2]

(b) Explain with reasons why the two types of power station you named in part (a) have these responses to demand. [2]

9. State one environmental problem caused by burning fossil fuels to produce electricity. [1 mark]

10. Write down the SI unit for area. [1 mark]

11. A coil of wire is connected to a sensitive ammeter as shown. A bar magnet is moved into and out of the coil. [4 marks]



Magnet and coil apparatus.

(a) State what effect moving the magnet into the coil has on the ammeter reading. [1]

(b) Explain why a current is induced in the coil when the magnet is moved. [2]

(c) State two changes you could make to increase the size of the induced current. [1]

12. Why are magnetic field lines drawn from the north pole to the south pole of a magnet? [2 marks]

13. The diagram below shows two isotopes of carbon: [4 marks]



Carbon-12 and Carbon-14 nuclei (schematic)

(a) State what is meant by the term "isotope". [1]

(b) Explain how the number of neutrons affects the stability of these two isotopes of carbon. [2]

(c) Give one possible use of a radioactive isotope of carbon. [1]

14. The diagram below shows part of our solar system, with the Sun, the Earth, and an artificial satellite orbiting Earth. [4 marks]



Part of the Solar System: Sun, Earth, Satellite

(a) What keeps the satellite in orbit around the Earth? State the force. [1]

(b) Name the unit used to measure the gravitational field strength on the surface of a planet. [1]

(c) Is the strength of gravity greater on Earth or on the Moon? Explain briefly. [2]

15. State the SI unit for length used in astrophysics. [1 mark]

16. A 1500 kg car is travelling at 18 m/s when the driver sees a hazard and reacts, then brakes to a stop. [5 marks]

(a) Calculate the momentum of the car before the driver reacts. [1]

(b) If the driver's reaction time is 0.6 s, calculate the thinking distance (distance travelled during reaction). [2]

(c) After braking, the car stops in 5.0 s. Calculate the average braking force acting on the car (assume constant deceleration). [2]

17. Rubber bands are often used to hold objects together. When you stretch a rubber band, you notice that the extension does not increase evenly as you add more force. [3 marks]

(a) Explain how the force-extension graph for a rubber band would look different to the graph for a metal spring. [2]

(b) Give one reason why a rubber band does not obey Hooke's law. [1]

18. A lamp is connected to the mains supply in a household circuit. The lamp has a power rating of 60 W and operates at 240 V. [6 marks]

(a) State the SI units for power, voltage, and current. [2]

(b) Calculate the current flowing through the lamp when it is operating at its rated power. [2]

(c) Explain how the use of a fuse in the plug protects the lamp and the user if a fault occurs. [2]

19. A hairdryer plug shows the label: 220 V, 660 W. The hairdryer uses a two-core cable but does not have an earth wire. [5 marks]

(a) Explain what is meant by 'double insulation' and why this hairdryer does not require an earth wire. [2]

(b) Calculate the current drawn by the hairdryer. [1]

(c) A fuse is chosen by dividing the power by the voltage, then rounding up to the next available size. State which value of fuse (from 3 A, 5 A, 13 A) is most suitable for this hairdryer. [1]

(d) Give two reasons why using a fuse is important for safety in this appliance. [1]

20. Which subatomic particle is transferred when a plastic rod is charged by friction? [1 mark]

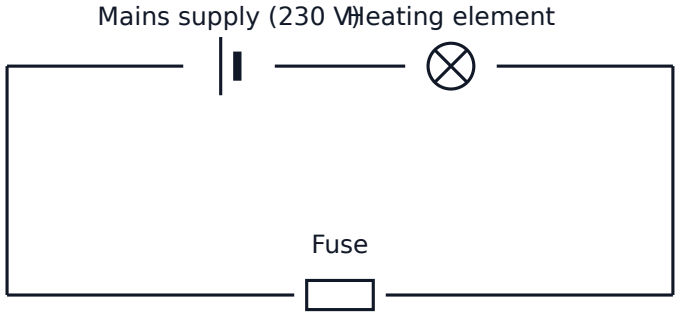
A Electron

B Proton

C Neutron

D Nucleus

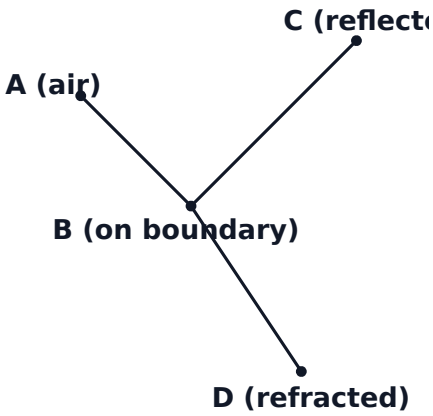
21. A hairdryer is connected to the mains. The diagram shows a simplified circuit with a fuse. [4 marks]



(a) Name two energy transfers that take place when the hairdryer is used. [2]

(b) Explain what happens to the fuse if the heating element develops a short circuit. [2]

22. A student shines a ray of light at an angle on the surface of water in a tank. Some of the ray is reflected and some is refracted. The diagram shows the ray and the normal. [4 marks]



Light ray striking water surface

Use the diagram to answer the following.

(a) Which ray shows reflection? Which shows refraction? Write their labels. [2]

(b) Describe the difference between reflection and refraction using this example. [2]

23. Which of the following statements is correct for a transverse wave? [1 mark]

A The vibrations are parallel to the direction of energy transfer.

B The vibrations are perpendicular to the direction of energy transfer.

C There are no vibrations in the wave.

D The frequency is measured in metres.

24. Which method of thermal energy transfer does NOT require particles or matter to move at all? [1 mark]

A Conduction

B Convection

C Radiation

D Evaporation

25. A builder lifts a bucket of cement with a force of 180 N to the top of some scaffolding 3.0 m above the ground. [3 marks]

(a) Calculate the work done by the builder on the bucket. [3]

26. A metal block is being used in a laboratory investigation. [5 marks]

(a) Describe how you would use apparatus to determine the density of the metal block, including the measurements needed. [3]

(b) The block has a mass of 480 g and its volume is found to be 60 cm^3. Calculate its density in kg/m^3. [2]

27. A student places a glass bottle full of air with a tight lid in a refrigerator. The air inside was initially at room temperature (22 °C) and atmospheric pressure (100 kPa). After several hours, the bottle's temperature has dropped to 4 °C. [5 marks]

(a) Explain, using the idea of gas particles, what happens to the pressure of the air in the bottle as it cools. [2]

(b) Calculate the final pressure of the air in the bottle, in kPa. Give your answer to 2 significant figures. (You must use the Kelvin scale for temperature.) [3]

28. State the equation linking pressure, force and area for a solid surface. Use standard symbols. [1 mark]

29. A student investigates how to create a uniform magnetic field using two bar magnets in the laboratory. [6 marks]

(a) Describe and draw the arrangement of two bar magnets to produce a uniform magnetic field between them. [2]

(b) Explain why the field in the region between the magnets is described as 'uniform'. [2]

(c) Give one use of a uniform magnetic field in a scientific or technical device. [1]

(d) Suppose the magnets are moved further apart. Describe what happens to the uniform region. [1]

30. Describe a simple experiment you could do to identify whether an unknown metal bar is made of a magnetic material. [3 marks]

31. A hospital uses a radioactive isotope that emits gamma radiation to sterilise medical equipment and measure the thickness of plastic film. The table shows typical penetrating and ionising properties of the three main types of radiation. [5 marks]

Penetrating and Ionising Properties

Radiation	Penetrating Power	Ionising Power
Alpha	Low (stopped by paper)	High
Beta	Medium (stopped by aluminium)	Medium
Gamma	Very high (stopped by thick lead)	Low

(a) Explain, using information from the table, why gamma radiation is suitable for both sterilising equipment and measuring the thickness of plastic film. [2]

(b) The activity of the radioactive source is measured in a laboratory. A scientist records a value of 5000 Bq at the start. State what the unit becquerel measures and convert the recorded activity to kBq. [2]

(c) Describe one safety precaution that workers should follow when handling radioactive sources. [1]

32. Describe two sources of natural background radiation that people are likely to experience. [2 marks]

33. State the unit of activity for a radioactive source. [1 mark]

34. The surface gravity on Mars is different from that on Earth. Astronomers also classify stars based on their colour and temperature. [5 marks]

(a) State the unit of gravitational field strength, and then use it to write the weight formula for an object of mass m on a planet with gravitational field strength g. [2]

(b) If a robot has a mass of 150 kg, calculate its weight on Mars where the gravitational field strength is 4 N/kg. [1]

(c) A scientist observes several stars. One is blue and another is red. Explain which has the higher surface temperature and why, based on the classification of stars by colour. [2]

35. The solar system contains a range of objects with different motions. [3 marks]

(a) *State one difference between the motion of a planet and a moon in the solar system.* [2]

(b) *Name one other type of object (not a planet or moon) found in our solar system.* [1]

36. The diagram below shows the results of an experiment to measure the movement of a toy truck. [3 marks]

Experiment data: Movement of toy truck

Distance travelled (cm)	Time taken (ms)
120	400
85	280

(a) Convert the distances and times for both runs to SI base units, giving your answers as decimals with the correct units and symbols. [2]

(b) State the SI base unit and symbol for length and for time. [1]

End of paper.

Finished this paper?

Check it yourself with the free mark scheme, or create a free SubjectCover account to take it again for marking, explanations and progress tracking.

subjectcover.com/practice/physics/papers/physics-exam-style-paper-1