

Candidate Name

Candidate Number

Centre Name

Centre Number

Model Paper

It is necessary to respond on the answer sheets provided alongside this question paper. Additionally, you must have a soft pencil (preferably of type B or HB), a clean eraser, and a dark blue or black pen.

INSTRUCTIONS:

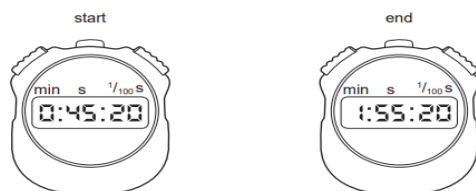
- You must write your name, candidate number, centre name, and centre number on the answer sheets in the designated spaces.
- The objective section consists of 25 questions, and you must attempt all of them.
- Each question has four options labelled A, B, C, and D. Select the option that you think is correct. Mark it on the multiple-choice answer sheet using a soft pencil.
- Attempt all the questions from the subjective section using a dark blue or black pen.

- It is important to follow the instructions provided on the answer sheets.
- Do not use correction fluid.
- Avoid writing on any bar codes.
- You are allowed to use a calculator if needed.

INFORMATION:

- This paper has a total of 100 marks.
- In the objective section, there are 25 questions, each carrying one mark.
There is no negative marking for incorrect responses.
- Subjective section comprises 75 marks
- The number of marks assigned for every question or its parts is indicated within brackets ().
- Rough work must be completed on this question paper.

1. A stopwatch is used to time a runner in a race. The diagrams show the stopwatch at the start and the end of the race.



How long did the runner take to run the race?

- A. 70.00 seconds
- B. 110.00 seconds
- C. 115.20 seconds
- D. 155.20 seconds

2. A student is weighed on laboratory scales. Which row about weight and mass is correct?

	unit of weight	unit of mass
A	kg	kg
B	kg	N
C	N	kg
D	N	N

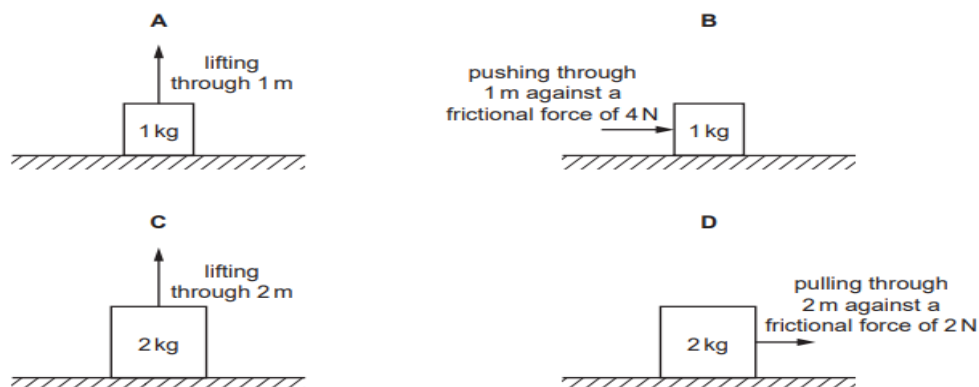
3. A boat is travelling at a steady speed in a straight line across the surface of a lake. Which statement about the boat is correct?

- A. The resultant force on the boat is in the direction of motion.
- B. The resultant force on the boat is in the opposite direction to its motion.
- C. The resultant force on the boat is vertically downwards.
- D. The resultant force on the boat is zero.

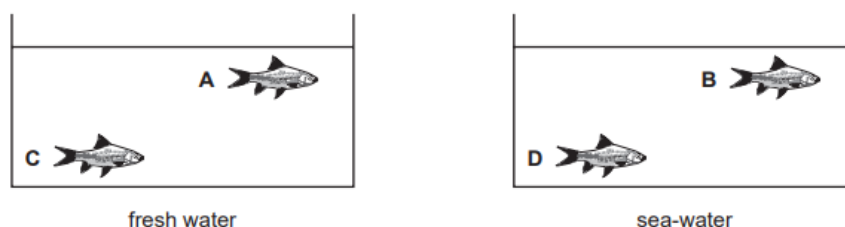
4. Energy resources are used to generate electricity. Which resource is renewable and does not release carbon dioxide when being used to produce electricity?

- A. biomass
- B. nuclear
- C. oil
- D. wind

5. A student does some simple exercises. In which exercise is the most work done?



6. Two identical fish tanks are filled to the same level with water. One tank contains fresh water. The other tank contains seawater. Sea water is more dense than fresh water. Which fish experiences the greatest pressure?



7. When a microscope is used to look at smoke particles in the air, Brownian motion is observed. What causes the smoke particles to move at random?

- A. Smoke particles are hit by air molecules.
- B. Smoke particles are moved by convection currents in the air.
- C. Smoke particles have different weights and fall at different speeds.
- D. Smoke particles hit the walls of the container.

8. It is a warm and humid day. A glass contains an iced drink. Water starts to form on the outside of the glass.



What is the name of the effect by which the water forms?

- A. condensation
- B. conduction
- C. convection
- D. evaporation

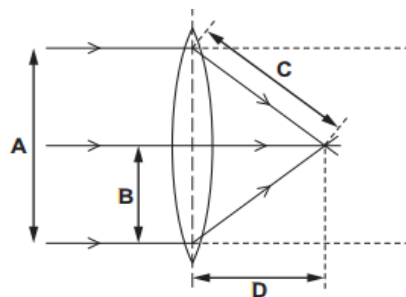
9. Four identical metal plates are painted either black or white and have either a dull or a shiny surface. They are heated to the same temperature. Which plate radiates thermal energy at the greatest rate?

- A. the plate that is dull and black
- B. the plate that is dull and white
- C. the plate that is shiny and black
- D. the plate that is shiny and white

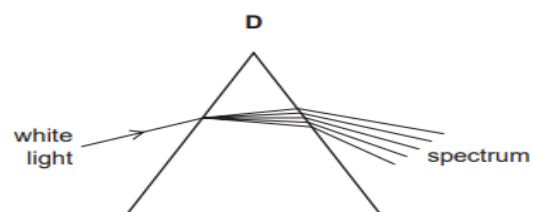
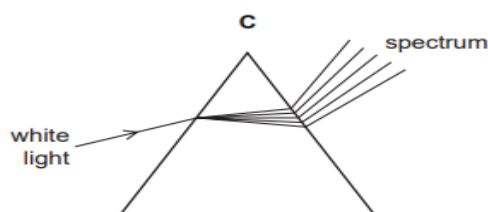
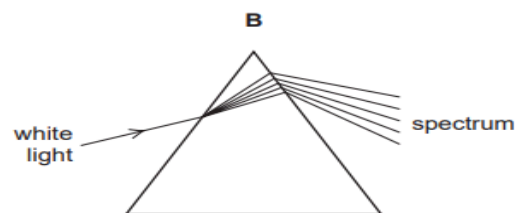
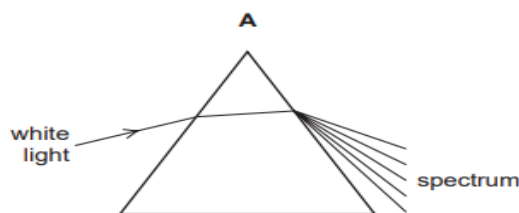
10. What causes the change in direction when light travels from air into glass?

- A. The amplitude of the light changes.
- B. The colour of the light changes.
- C. The frequency of the light changes.
- D. The speed of the light changes.

11. The diagram shows rays of light passing through a converging lens. Which labelled arrow represents the focal length of the lens?



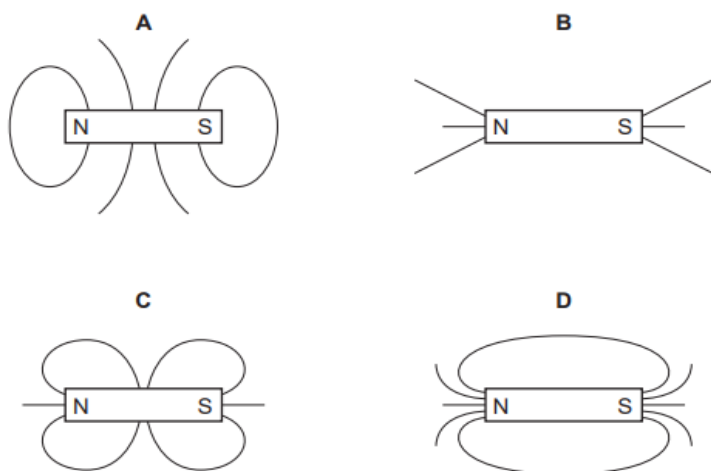
12. Which diagram shows what happens when a ray of white light passes through a prism?



13. A student rubs a plastic rod with a cloth. The rod becomes positively charged. What has happened to the rod?

- A.** It has gained electrons.
- B.** It has gained protons.
- C.** It has lost electrons.
- D.** It has lost protons.

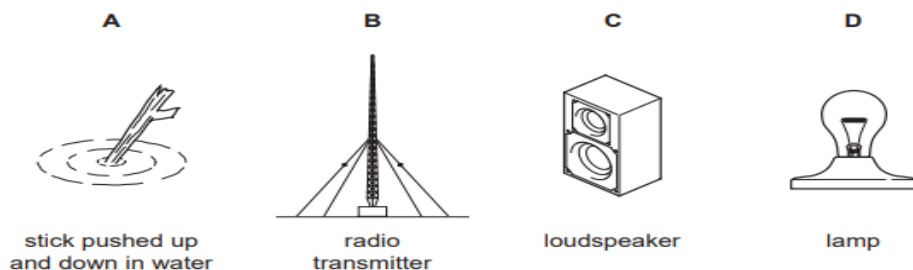
14. Which diagram shows the pattern of magnetic field lines around a bar magnet?



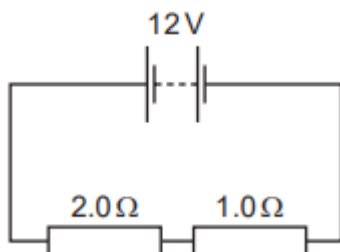
15. A fire alarm is not loud enough and the pitch is too low. An engineer adjusts the alarm so that it produces a louder note of a higher pitch. What effect does this have on the amplitude and the frequency of the sound?

	amplitude	frequency
A	larger	greater
B	larger	smaller
C	smaller	greater
D	smaller	smaller

16. The diagrams show four sources of waves. Which source produces longitudinal waves?



17. The circuit shows a 2.0Ω resistor and a 1.0Ω resistor connected to a 12V battery.



What is the current in the 2.0Ω resistor?

- A. 4.0A
- B. 6.0A
- C. 24A
- D. 36A

18. A sample of radioactive isotope is decaying. Nuclei of which atoms will decay first?

- A. It is impossible to know because radioactive decay is random.
- B. It is impossible to know unless the age of the material is known.
- C. The atoms near the centre will decay first because they are surrounded by more atoms.
- D. The atoms near the surface will decay first because the radiation can escape more easily.

19. An element has two isotopes. Which row compares the numbers of particles in the nuclei of the atoms of these isotopes?

	number of neutrons	number of protons	number of nucleons
A	different	the same	different
B	different	the same	the same
C	the same	different	different
D	the same	different	the same

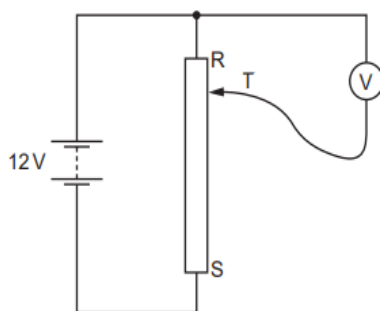
20. What is the purpose of a relay?

- A. to change a large voltage into a small voltage
- B. to change a small voltage into a large voltage
- C. to use a large current to switch on a small current
- D. to use a small current to switch on a large current

21. Which row gives the relative charge of an electron, a neutron and a proton?

	electron	neutron	proton
A	-1	0	-1
B	-1	0	+1
C	+1	-1	0
D	+1	0	+1

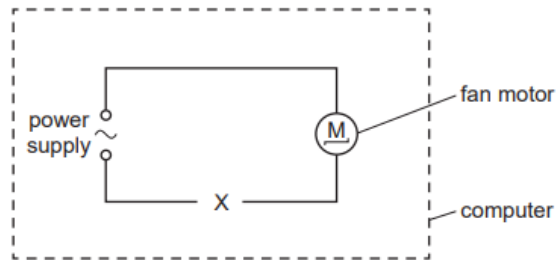
22. A student connects a variable potential divider (potentiometer) circuit.



As the sliding terminal T is moved from R to S, what happens to the reading on the voltmeter?

- A. It decreases from 12V to 0V.
- B. It increases from 0V to 12V.
- C. It remains at 0V.
- D. It remains at 12V.

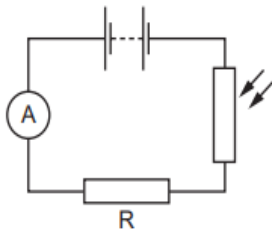
23. A computer engineer wants the speed of a fan to increase automatically when the temperature inside a computer rises. The engineer knows that a larger current causes the fan to turn more quickly.



Which component should be placed at X to make this happen?

- A. a relay
- B. a thermistor
- C. a transformer
- D. a variable resistor

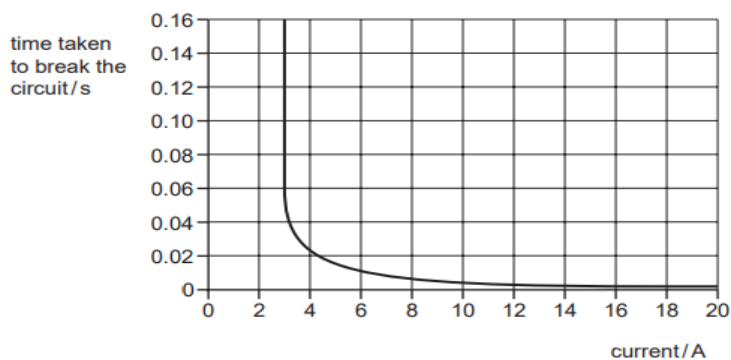
24. A light-dependent resistor (LDR) and a resistor R are connected in a series circuit. Light falls on the LDR.



The brightness of the light falling on the LDR decreases. What happens to the resistance of the LDR and what happens to the reading on the ammeter?

	resistance of LDR	reading on ammeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

25. A circuit breaker is designed to protect a circuit which usually carries a current of 2A. The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2A and what happens when the current is 18A?

	when the current is 2 A	when the current is 18 A
A	the circuit breaks in less than 0.01 s	the circuit breaks in less than 0.01 s
B	the circuit breaks in less than 0.01 s	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 0.01 s
D	the circuit does not break	the circuit does not break

THEORETICAL PORTION

MARKS: 45

1. i) State 2 uses of radioactivity. [2]

ii) Define the terms gamma-particle and gamma decay. [2]

iii) State Heisenberg's uncertainty principle. [3]

iv) What is the working Principle of Step-Down Transformers? [3]

v) How does the electromagnetic field affect the human body? [3]

2. i) Which circuit draws the smallest current from the cell, assuming both cells are identical? [2]

ii) Define a Semi-Conductor with examples. [3]

iii) State Coulomb's Law, write its formula and draw a diagram. [4]

iv) Name the important properties of waves and represent them in a diagram. [4]

v) It takes 427.5 J to heat 75 grams of copper from 35 °C to 65 °C. What is the specific heat in Joules/g°C? [2]

3. i) Write some characteristics of gas. [2]

ii) Superman stops a truck from moving downhill by applying force to it. Is this an example of work being done? [3]

iii) Define the Law of Conservation of Energy. [2]

iv) Write out step-by-step instructions for an experiment to find the position of the centre of mass of a plane lamina. [2]

v) A doctor uses an ultrasound scan instead of an X-ray to measure the kidneys. Explain why. [2]

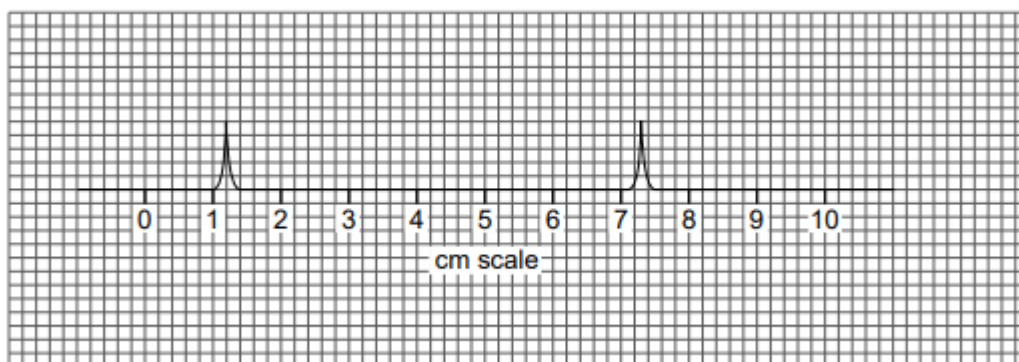
3. i) The power of the shaver is 1.1 W. Calculate the current flowing through the shaver. Use the equation: power = potential difference \times current. Give your answer to 2 significant figures. [3]

ii) Give three reasons why the safe storage of waste materials from nuclear reactors is controversial. [3]

PRACTICAL PORTION

MARKS: 30

1. Fig shows the screen of the CRO when it is being used to measure a small time interval between two voltage pulses.

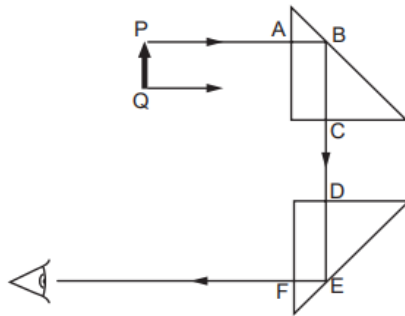


(i) What is the distance on the screen between the two voltage pulses? [2]

(ii) The time-base control of the CRO is set at 5.0 ms/cm. Calculate the time interval between the voltage pulses. [2]

(iii) Suggest one example where a CRO can be used to measure a small time interval. [2]

2. Fig shows a ray of light, from the top of an object PQ, passing through two glass prisms.



(a) Complete the path through the two prisms of the ray shown leaving Q. [2]

(b) A person looking into the lower prism, at the position indicated by the eye symbol, sees an image of PQ. State the properties of this image. [2]

(c) Explain why there is no change in the direction of the ray from P at points A, C, D and F. [2]

(d) The speed of light as it travels from P to A is 3×10^8 m/s and the refractive index of the prism glass is 1.5. Calculate the speed of light in the prism. [2]

(e) Explain why the ray AB reflects through 90° at B and does not pass out of the prism at B. [2]

3. (a) α -particles, β -particles and γ -rays are known as ionising radiations.

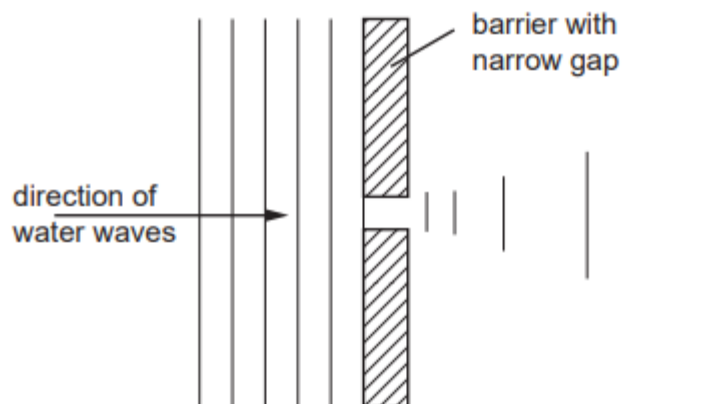
(i) Describe what happens when gases are ionised by ionising radiations. [2]

(ii) Suggest why α -particles are considered better ionisers of gas than β -particles. [2]

(b) (i) Suggest two practical applications of radioactive isotopes. [2]

(ii) For one of the applications that you have suggested, describe how it works, or draw a labelled diagram to illustrate it in use. [2]

4. Fig is a drawing of a student's attempt to show the diffraction pattern of water waves that have passed through a narrow gap in a barrier.



(a) State things that are wrong with the wave pattern shown to the right of the barrier. [3]

(b) In the space below, sketch the wave pattern when the gap in the barrier is made five times wider. [3]