

## SINGAPORE CHINESE GIRLS' SCHOOL END-OF-YEAR EXAMINATION 2024 YEAR FOUR INTEGRATED PROGRAMME

CANDIDATE NAME		
CLASS	REGISTER NUMBER	

# PHYSICS

**PAPER 1** Multiple Choice

## Wednesday

9 October 2024

1 Hour

Additional Materials: Multiple Choice Answer Sheet

### **READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and index number on the Question Paper **and** Answer Sheet in the spaces provided.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C**, **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

#### Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

Take  $g = 10 \text{ ms}^{-2}$  or 10 Nkg<sup>-1</sup> unless specified otherwise

#### This question paper consists of 24 printed pages

- 1 Which pair consists of both vector quantities?
  - A Force and power
  - B Pressure and volume
  - **C** Acceleration and weight
  - D Density and kinetic energy
- **2** Four rectangular blocks, T, U, V and W are shown. Each block is labelled with its dimensions and mass.



Which two blocks have the same density?

A U and V

B V and W

C T and U

D T and V

Forces of 40 N and 25 N act on an object in the directions shown.



Which arrow shows the direction of the resultant force on the object?



**4** A ball is dropped from the top of a ladder. It falls vertically through air and rebounds in a vertical path upon hitting the ground.

Assuming that no energy is lost during its impact with the ground and that air resistance is negligible, which velocity-time graph best describes the motion of the ball?



5 A brick, initially at rest, falls from a height of *h* and took 2.0 s to reach the ground.



The acceleration of free fall,  $g = 10 \text{ m/s}^2$ 

What is the height *h* of the brick?

- **A** 10 m
- **B** 20 m
- **C** 30 m
- **D** 40 m
- 6 A car is initially travelling along a straight path at 5.0 m/s. It then accelerates at  $2.0 \text{ m/s}^2$  for 10 s. What is the final speed of the car?
  - **A** 5.0 m/s
  - **B** 10 m/s
  - **C** 20 m/s
  - **D** 25 m/s

7 A 10 kg mass is initially at rest on a rough horizontal surface. A horizontal force is then applied to it and the force applied varies according to the diagram shown.



Given that the frictional force acting on the mass when it is moving is 1 N, what is the acceleration of the mass between 15 s to 25 s?

8 Which situation(s) correctly describe(s) an action-reaction pair?

- I Both forces act at the same time.
- II Both forces act on the same body.
- III Both forces act in different directions.
- **IV** Both forces have the same magnitude.
- A I only
- B II and III only
- C I, III and IV only
- D I, II, III and IV

**9** The figure shows two trainee divers diving from the same height into a pool.

Assuming that the air resistance is negligible, which physical quantity is different between the divers just before they hit the water?



- A Velocity
- **B** Acceleration
- **C** Energy in kinetic store
- D Distance travelled
- **10** A toy car was pushed steadily from rest to reach a speed of 5.0 m/s in 10 s. During this time, there was an average air resistance of 3.0 N acting on the car.

Calculate the average rate of work done against air resistance.

- **A** 7.5 W
- **B** 15 W
- **C** 75 W
- **D** 150 W

A weightlifter picks up a stone ball and places it on a shelf.Each lift takes the same time.Which situation requires the greatest power?



- **12** Electrical energy may be obtained from nuclear fission. In which order is the energy transferred in this process?
  - A nuclear fuel  $\rightarrow$  generator  $\rightarrow$  reactor and boiler  $\rightarrow$  turbines
  - $\textbf{B} \qquad \text{nuclear fuel} \rightarrow \text{generator} \rightarrow \text{turbines} \rightarrow \text{reactor and boiler}$
  - $\textbf{C} \qquad \text{nuclear fuel} \rightarrow \text{reactor and boiler} \rightarrow \text{generator} \rightarrow \text{turbines}$
  - $\textbf{D} \qquad \text{nuclear fuel} \rightarrow \text{reactor and boiler} \rightarrow \text{turbines} \rightarrow \text{generator}$



13 The diagram shows a uniform beam 100 cm long. The diagram is not drawn to scale.

The beam remains balanced on a pivot at the 50 cm mark under the action of the forces of 4.0 N, 5.0 N and 6.0 N.

The 4.0 N force is at the 20 cm mark and the 6.0 N force is at the 60 cm mark.

At which point on the beam is the 5.0 N force acting?

- A at the 62 cm mark
- B at the 74 cm mark
- C at the 86 cm mark
- D at the 88 cm mark
- 14 The diagram shows two identical bars of negligible weight. All the forces acting on each bar are marked.



Which bars are in equilibrium?

- A bar 1 and bar 2
- B bar 1 only
- C bar 2 only
- **D** neither bar 1 nor bar 2

**15** Four identical submarines P, Q, R and S are lowered from one depth to another in water of a constant density.

The initial and final depths of each submarine are shown in the diagram.



Which row is correct for the difference in pressure from the initial to final depth of each submarine?

	least change in pressure	greatest change in pressure
А	submarines P and Q	submarines R and S
В	submarines P and Q	submarine R only
С	submarine P only	submarines R and S
D	submarine P only	submarine R only

**16** The diagram shows a U-tube manometer containing three liquids: mercury, liquid X and liquid Y. Neither liquid X or liquid Y mixes with mercury.



Which row correctly compares the pressures exerted by liquid X and liquid Y on the mercury, and the densities of liquid X and liquid Y?

	pressure exerted by X and by Y on the mercury	densities of X and of Y
А	pressure of X is greater than Y	density of X is greater than Y
В	pressure of Y is greater than X	density of Y is greater than X
С	pressure of X and of Y is the same	density of X is greater than Y
D	pressure of X and of Y is the same	density of Y is greater than X

**17** Diagram 1 shows a tube sealed at one end and partly immersed in mercury. The tube has a diameter *d*. The top of the mercury in the tube is a height *h* above the mercury reservoir.



Diagram 2 shows a similar arrangement with a tube that has a diameter 2d.



What is the relationship between *h* and *x*? (diagrams are not drawn to scale )

- A x = 2h
- **B** x = h
- **C**  $x = \frac{h}{2}$
- **D**  $x = \frac{h}{4}$



Four statements regarding the molecules are given.

- 1 The molecules expand and impact the container's wall with a greater force.
- 2 The molecules maintain the same average distance and hit the container with a greater force at a particular temperature.
- 3 The molecules move faster and hit the container more often.
- 4 The molecules move further apart and hit the container more often.

Which statements are correct ?

**A** 2&3 **B** 3&4 **C** 1,2&3 **D** 2,3&4

19 In which situation is the main transfer of thermal energy by convection?



transfer from grill to food

B a cold drink stored in a vacuum flask



transfer from air to drink

С









transfer from the Sun to water

**20** A cylinder with a tap contains a fixed mass of gas X. The gas is enclosed by a piston which can move freely towards or away from the tap.



When the tap is opened, the piston moves slightly to the right, towards the tap.



What can be deduced about the pressure of gas X?

	before opening tap	after opening tap
A	less than atmospheric pressure	more than atmospheric pressure
в	same as atmospheric pressure	more than atmospheric pressure
С	more than atmospheric pressure	less than atmospheric pressure
D	more than atmospheric pressure	same as atmospheric pressure

**21** A liquid is evaporating.

Which statement about the liquid is correct at an instant in time?

- A Any molecule can escape, and from any part of the liquid.
- **B** Any molecule can escape, but only from the liquid's surface.
- **C** Only molecules with enough energy can escape, and only from the liquid's surface.
- **D** Only molecules with enough energy can escape, but from any part of the liquid.

22 The diagram shows a flask which has been filled with liquid X at room temperature.



When the flask is placed in warm water, the liquid rises higher up the tube. When the flask is put in cold water, the liquid drops below the original level in the tube.

The experiment is repeated using an identical flask but a different liquid Y. The initial level of the liquid in the tube is the same as that in the original experiment.

Liquid Y expands more, per degree increase in temperature, than liquid X.

Which row correctly compares X and Y in terms of the levels of the liquids when the flask is placed in warm and cold water?

	rises more in warm water	falls more in cold water
Α	Х	Х
в	Х	Y
С	Y	Х
D	Y	Y

**23** Two metallic spheres X and Y are placed in contact. A positively charged rod Z is then brought near them as shown in the figure below.



The figure below shows that X is being earthed without removing Z.



What are the corresponding charges in X and Y?

- **A** Both X and Y will be positively charged.
- **B** X will be positively charged, and Y will be neutral.
- **C** X will be neutral, and Y will be negatively charged.
- **D** X will be positively charged, and Y negatively charged.
- 24 The diagram below shows two conducting spheres A and B of the same mass hanging from insulating threads of the same length. The charge of A is +5 C and the charge of B is +10 C. The electric forces on A and B are  $F_1$  and  $F_2$ respectively.



Which statement about the electric forces  $F_1$  and  $F_2$  and the angles x and y is correct?

- **A**  $F_1 > F_2$  and x > y
- **B**  $F_1 < F_2$  and x < y
- **C**  $F_1 = F_2$  and x = y
- **D**  $F_1 = F_2$  and x < y

25 An electrical circuit with two lamps and three ammeters with negligible resistance is set up as shown below. The switch is initially open.

When the switch is closed, which relationship is correct?



**A**  $A_1 = A_2$ 

$$\mathbf{B} \qquad A_1 > A_2$$

$$\mathbf{C} \qquad \mathsf{A}_2 = \mathsf{A}_3$$

$$\mathbf{D} \qquad \mathbf{A}_1 + \mathbf{A}_3 = \mathbf{A}_2$$

26 In the circuit shown, all five resistors have the same resistance. Which resistor will have the greatest potential difference across it?



- **A** R<sub>1</sub>
- **B** R<sub>2</sub>
- C R₃
- D R<sub>4</sub> & R<sub>5</sub>

Four identical light bulbs are connected to an ideal battery as shown in the diagram. The filament of Bulb 1 breaks. What happens to the ammeter reading and the brightness of the remaining bulbs?



	Ammeter Reading	Bulb 2	Bulb 3	Bulb 4	
Α	Increase	Dimmer	Brighter	Brighter	
в	Decrease	Dimmer	Brighter	Brighter	
С	Increase	Brighter	Dimmer	Dimmer	
D	Decrease	Brighter	Dimmer	Dimmer	

The diagram shows an electrical plug of a 1500 W electric kettle connected to a 240 V supply.



What is the current in the three wires when the kettle is working normally?

	live wire / A	neutral wire / A	earth wire / A		
Α	0	0	6.25		
В	6.25	0	0		
С	6.25	6.25	0		
D	6.25	6.25	6.25		

29 Four wires are made of the same metal.

Which wire has the greatest resistance?

- A a 100 cm long wire with a diameter of 3.0 mm
- **B** a 100 cm long wire with a diameter of 6.0 mm
- **C** a 10 cm long wire with a diameter of 3.0 mm
- **D** a 10 cm long wire with a diameter of 6.0 mm
- **30** A student places object X on a balance. The student first brings magnet Y and then magnet Z close to object X and observes the readings on the balance. The distance between Y and X is the same as the distance between Z and X.

The diagram shows the results of the experiment.



Which statement explains the results?

- A Object X is an iron block and magnet Y is stronger than magnet Z.
- **B** Object X is an iron block and magnet Y is weaker than magnet Z.
- **C** Object X is a permanent magnet and magnet Y is stronger than magnet Z.
- **D** Object X is a permanent magnet and magnet Y is weaker than magnet Z.



**31** The diagram shows three compasses placed around a wire connected to a supply.

Compass Q is placed above the wire while compasses P and R are placed in the plane of the paper.

When the switch is closed, which is the correct directions the compasses are pointing ?



**32** A short bar magnet passes at a constant speed through a long solenoid. A galvanometer is connected across the solenoid.



Which graph best represents the variation of the galvanometer deflection  $\theta$  with time t?



**33** The diagram shows a transformer that has 100 turns in the primary coil and 10 turns in the secondary coil. 50 V of alternating voltage is applied to the primary coil. The secondary coil is connected to a resistor of  $25 \Omega$ .



Determine the current passing through the 25  $\Omega$  resistor.

- **A** 0.050 A **B** 0.20 A **C** 5.0 A **D** 20 A
- **34** The diagram shows two ducks P and Q sitting on a pond. A wave moves across the pond from right to left.



At the moment shown, duck Q is at a maximum displacement and duck P has zero displacement.

In the next quarter cycle of the wave,

- A both P and Q are moving down.
- **B** P is on the verge of moving down and Q is moving down.
- **C** P is on the verge of moving up and Q is moving down.
- **D** P is stationary and Q moving up

**35** Visible light, X-rays and microwaves are all components of the electromagnetic spectrum.

Which statement about the waves is correct?

- A In a vacuum, microwaves travel faster than visible light and have a shorter wavelength.
- **B** In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.
- **C** In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.
- **D** In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.
- **36** The graph shows the variation with time of displacement for two different waves X and Y.



Wave X has frequency *f* and amplitude *A*. What is the frequency and what is the amplitude of wave Y?

	frequency	amplitude
A	$\frac{1}{2}f$	$\frac{1}{2}A$
в	$\frac{1}{2}f$	2A
С	2f	$\frac{1}{2}A$
D	2f	2A

**37** The graph shows how the intensity of electromagnetic radiation emitted from a distant star varies with wavelength.



In which region of the electromagnetic spectrum is the radiation of greatest intensity?

- A infrared B visible light C ultraviolet D X-ray
- **38** A radioactive material is placed near a detector.

The detector shows a count rate of 28 000 counts /min.

When a piece of card is put between the material and the counter, the reading decreases to 25 000 counts /min.

When an aluminium sheet is put between the material and the counter, the reading remains at 25 000 counts /min.

When a sheet of lead is put between the material and the counter, the reading decreases to 19 000 counts /min.

What is being emitted by the radioactive material?

- **A**  $\alpha$ ,  $\beta$  and  $\gamma$ -radiation
- **B**  $\alpha$  and  $\gamma$  -radiation only
- **C**  $\alpha$  and  $\beta$ -radiation only
- **D**  $\beta$  and  $\gamma$  -radiation only

- **39** Which statement explains why radioactive materials need to be handled carefully?
  - **A**  $\gamma$ -rays are part of the electromagnetic spectrum.
  - **B** Radioactive decay is a random process.
  - **C** Radioactive materials have a half-life.
  - **D** The radiation given out is ionising.
- 40 When a radioactive isotope is set up close to a counter, a count rate of 38 000 counts/s is obtained. The table shows the count rate from the isotope over a three year period.

time / years	count rate counts/s		
0	38000		
1	26000		
2	17000		
3	12000		

What is the half-life of the isotope?

- A less than 1 year
- **B** more than 1 year but less than 2 years
- **C** more than 2 years but less than 3 years
- D more than 3 years

END OF PAPER





1	2	3	4	5	
6	7	8	9	10	
11	12	13	14	15	
16	17	18	19	20	
21	22	23	24	25	
26	27	28	29	30	
31	32	33	34	35	
36	37	38	39	40	