Class:



DUNMAN HIGH SCHOOL Preliminary Examination Year 6

H1 PHYSICS

Paper 1 Multiple Choice

8867/01 23 September 2024 1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your centre number, index number, name and class at the top of this page. Write in soft pencil.

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

There are **thirty** 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 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.

2

Data

speed of light in free space,	C =	3.00 × 10 ⁸ m s ⁻¹
elementary charge,	e =	1.60 × 10 ⁻¹⁹ C
unified atomic mass constant,	<i>u</i> =	1.66 × 10 ⁻²⁷ kg
rest mass of electron,	m _e =	9.11 × 10 ⁻³¹ kg
rest mass of proton,	<i>m</i> _p =	1.67 × 10 ⁻²⁷ kg
the Avogadro constant,	N _A =	6.02 × 10 ²³ mol ^{−1}
gravitational constant,	G =	6.67 × 10 ⁻¹¹ N m ² kg ⁻²
acceleration of free fall,	<i>g</i> =	9.81 m s⁻²

Formulae

uniformly accelerated motion,	$s = ut + \frac{1}{2}at^2$
	$v^2 = u^2 + 2as$
resistors in series,	$R = R_1 + R_2 + \dots$
resistors in parallel,	$1/R = 1/R_1 + 1/R_2 + \dots$

- 1 Which expression could be correct for the velocity v of the ocean waves in terms of the density of sea water ρ , the acceleration of free fall g, the depth of the ocean h, and the wavelength λ ?
 - A $\sqrt{\frac{g}{\rho}}$ B $\sqrt{\frac{g}{h}}$ C $\sqrt{\rho g h}$ D $\sqrt{g \lambda}$
- 2 Two forces of magnitudes 4 N and 6 N are applied to a point

Which of the following could not be the magnitude of their resultant?

- **A** 1 N **B** 4 N **C** 6 N **D** 10 N
- 3 A steel rule, reading to ± 1 mm, gives the following results when used to measure the length of a bar.

892 mm, 891 mm, 892 mm, 891 mm, 891 mm, 892 mm

If the true length of the bar is 895 mm, which row in the table is correct?

	results are accurate to within 1 mm	results are precise to within 1 mm
Α	no	yes
В	no	no
С	yes	yes
D	yes	no

4 A motorcycle stunt-rider rides off a ramp inclined at 30.0° to the horizontal at a speed of 22.0 m s⁻¹. He reaches a maximum height of 13.0 m from the ground before he lands on the ground.

What is his velocity just before he lands on the ground?

A 19.1 m s⁻¹ **B** 24.9 m s⁻¹ **C** 26.1 m s⁻¹ **D** 27.2 m s⁻¹

5 A car starts from rest and travels along a straight road. The graph below shows the variation with time *t* of its acceleration *a*, during part of the journey.



At which points on the graph does the car have its greatest speed and greatest displacement?

	greatest displacement	greatest speed
Α	К	J
В	К	Μ
С	L	L
D	Μ	К

6 A 6.0 kg mass is connected to a 10 kg mass by a rope and was left to hang freely from a pulley as shown in the diagram below.



What is the tension in the string?

 A
 39 N
 B
 59 N
 C
 74 N
 D
 98 N

7 A stone, falling vertically through air at its terminal velocity, strikes a soft ground and suffers a constant deceleration until it stops. The time of impact is denoted by P.

Which graph best represents the variation with time t of the momentum p on the stone?





8 Two objects collide inelastically.

Which row is correct?

	kinetic energy	momentum
Α	conserved	conserved
В	conserved	not conserved
С	not conserved	conserved
D	not conserved	not conserved

9 A light rod, acted upon by 3 forces, P, Q, and R is in equilibrium.

Which of the following diagram shows the possible positions and directions of the forces?



- **10** A spring that obeys Hooke's law has an unstretched length of 60 mm and a spring constant of 500 N m⁻¹. What is the tension in the spring when it is stretched to 90 mm?
 - **A** 15 N **B** 45 N 1500 N **D** 45000 N
- 11 The diagram shows two equal and opposite forces applied to the ends of a bar of length *L*.



What is the magnitude of the torque exerted by these forces on the bar?

A $FL \cos \theta$ **B** $FL \sin \theta$ **C** $2FL \cos \theta$ **D** $2FL \sin \theta$

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12 A hydroelectric power station is shown.



Water is supplied from a reservoir which is 80m above the power station. The water passes through the turbines of the power station at a rate of 6.0 m³ s⁻¹.

Assume that the density of water is 1000 kg m⁻³. If the efficiency of the power station is 60%, what is the electrical power output?

Α	0.29 MW	В	1.9 MW	С	2.8 MW	D	4.7 MW
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13 A spring of original length 100 mm is compressed by a force. The graph shows the variation with length L of the spring of the compressing force F.



What is the energy stored in the spring when the length is 70 mm?

A 0.09 J **B** 0.21 J **C** 0.27 J **D** 0.63 J

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14 A locomotive, which delivers a constant power, is used to pull a train of total mass 3.0×10^5 kg against a constant frictional force of 5.0×10^4 N. When travelling at 10 m s⁻¹, the acceleration of the train is 0.50 m s⁻².

What is the maximum speed of the train on a level track?

- **A** 20 m s⁻¹ **B** 30 m s⁻¹ **C** 40 m s⁻¹ **D** 50 m s⁻¹
- **15** A small ball enters a vertical circular loop with speed v such that the ball is just able to complete the loop as shown.



The angular velocity of the ball is

- A zero at the top of the circle.
- **B** the same at the top and bottom of the circle.
- **C** smallest at the bottom of the circle and largest at the top of the circle.
- **D** largest at the bottom of the circle and smallest at the top of the circle.
- **16** A disc is rotated clockwise about its centre O until point P has moved to point Q, such that OP is equal in length to the straight-line PQ.



What is the angular displacement of OQ relative to OP?

Α	$\frac{1}{3}\pi$ rad		В	$\frac{2}{3}\pi$ rad
С	$\frac{4}{3}\pi$ rad		D	$rac{5}{3}\pi$ rad
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17 Two identical objects P and Q, rest on a flat rough circular disc.



The disc spins about its central axis with increasing rate. When the disc spins at a certain rate, one of the objects slides off the disc.

Which statement is correct?

- **A** P experiences larger friction than Q.
- **B** Q will start to slide first due to its larger distance from the axis.
- **C** Q will start to slide first due to its larger angular velocity.
- **D** The friction experienced by P and Q are always equal.
- **18** In the circuit below, three identical resistors of resistance 1.0 k Ω are connected to a cell of 1.2 V with negligible resistance.



How many electrons pass through point X in a minute?

Α	2.5 × 10 ¹⁵	В	1.5 × 10 ¹⁷	С	2.5×10^{18}	D	1.5×10^{20}
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19 Which graph best represents the resistance-temperature characteristics of a negative temperature coefficient thermistor?



20 The current measured by an ammeter in a circuit is tripled when a 500 Ω resistor is connected in parallel with a resistor with resistance *R* in the circuit below.



Which of the following gives the value of R?

 A
 250 Ω
 B
 500 Ω
 C
 1000 Ω
 D
 1500 Ω

21 Two resistors of resistance 200 k Ω and 1.0 M Ω are connected in series, with its outer junctions maintained at potentials of 3.0 V and -15 V as shown.



22 Two resistors are connected in a circuit with a power supply and a voltmeter as shown.



Which of the following gives the range of values that could be obtained by the voltmeter?

- A zero to 1.0 V
- **C** 1.0 V to 5.0 V

- **B** zero to 6.0 V
- **D** 1.0 V to 6.0 V
- **23** A conductor of length *l* carrying current *I* is placed inside a uniform horizontal magnetic field of flux density *B*. The conductor makes an angle of 30° with the vertical as shown.



What is the magnetic force acting on the conductor?

A zero **B** *B11* **C** *B11* sin 30° **D** *B11* sin 60°

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24 A large horseshoe magnet produces a uniform magnetic field of flux density *B* between its poles. The magnet is placed on a top-pan balance and a wire XY is situated between its poles as shown.



The wire XY is placed perpendicular to the magnetic field. The length of wire between the poles is 4.4 cm. A direct current of magnitude 2.6 A is passed through the wire in the direction from X to Y. The reading on the top-pan balance increases by 2.3 g.

What is the polarity of pole P of the magnet and the magnitude of the flux density *B* between the poles?

	polarity of pole P	B/T
Α	north	0.20
В	north	2.0
С	south	0.20
D	south	2.0

25 The diagram shows a metal spring connected to a circuit. The input signal produces a current which changes direction according to the graph shown.

What will happen with switch S is closed?



- A Nothing will happen.
- **B** The spring will start oscillating.
- **C** The spring will be extended slightly.
- **D** The spring will be compressed slightly.
- **26** Two nuclides P and Q have equal nucleon numbers. However, the mass of the nucleus of P is larger than the mass of the nucleus of Q. It can be concluded that
 - **A** P is more stable than Q.
 - **B** P has a greater binding energy than Q.
 - **C** P requires less energy than Q to be separated into its individual nucleons.
 - **D** P requires more energy than Q to be separated into its individual nucleons.

27 The figure shows an enlarged portion of the variation with nucleon number of the average binding energy per nucleon.



During the fission of a Uranium-236 nucleus, the nucleus splits into roughly two equal parts and

- A approximately 200 MeV of energy is absorbed
- **B** approximately 1800 MeV of energy is absorbed
- C approximately 200 MeV of energy is released
- **D** approximately 1800 MeV of energy is released
- **28** The given diagram illustrates a thin gold foil being bombarded with α-particles.



What is the information provided by the results of this experiment?

- A Size of a gold nucleus
- B Structure of a gold nucleus
- **C** Binding energy of a gold nucleus
- D Energy levels of electrons in gold atoms

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29 A uniform electric field of strength *E* is created between two horizontal plates P and Q. An alpha particle, beta particle and gamma photon enter the field as shown.



What are the deflections of the particles in the electric field?

	alpha particle	beta particle	gamma photon
Α	towards P	towards Q	undeflected
в	towards P	undeflected	towards Q
С	towards Q	towards P	undeflected
D	towards Q	undeflected	towards P

- **30** Which observation illustrates the random nature of radioactive decay?
 - A Activity of a radioactive sample decreases with time.
 - **B** Fluctuations exist in the count rate from a radioactive sample.
 - **C** Heating a radioactive sample has no effect on its rate of decay.
 - **D** Certain isotopes of a particular element are radioactive while others are not.

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