Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Promotional Examination
Year 5

H2 PHYSICS — 9749/01

29 September 2023

Paper 1 Multiple Choice Questions — **30 minutes**

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

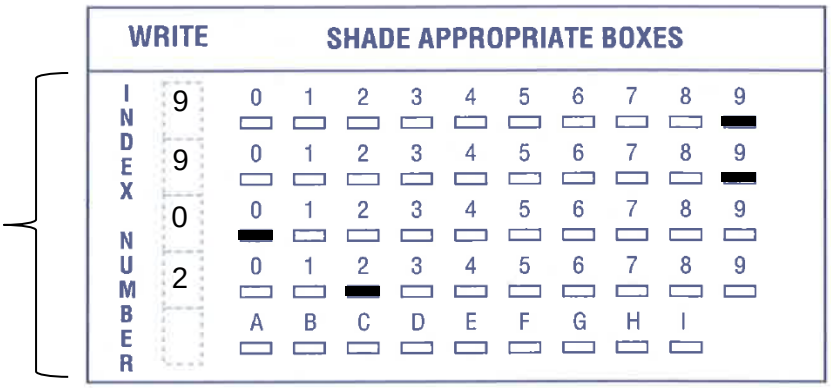
Write your class, index number and name at the top of this page.
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.

There are **fifteen** 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.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
The use of an approved scientific calculator is expected, where appropriate.

Write your name and class on the Multiple Choice Answer Sheet. Write and shade the Index Number as follows.

For illustration only:

A student from class 5C99, with index number 02, should shade "9902".



Data

speed of light in free space,	c	=	3.00×10^{8} m s^{-1}
permeability of free space,	μ_o	=	$4\pi \times 10^{-7}$ H m^{-1}
permittivity of free space,	ε_o	=	8.85×10^{-12} F m^{-1}
		=	$(1/(36\pi)) \times 10^{-9}$ F m^{-1}
elementary charge,	e	=	1.60×10^{-19} C
the Planck constant,	h	=	6.63×10^{-34} J s
unified atomic mass constant,	u	=	1.66×10^{-27} kg
rest mass of electron,	m_e	=	9.11×10^{-31} kg
rest mass of proton,	m_p	=	1.67×10^{-27} kg
molar gas constant	R	=	8.31 J K^{-1} mol^{-1}
the Avogadro constant,	N_A	=	6.02×10^{23} mol^{-1}
the Boltzmann constant,	k	=	1.38×10^{-23} J K^{-1}
gravitational constant,	G	=	6.67×10^{-11} N m^2 kg^{-2}
acceleration of free fall,	g	=	9.81 m s^{-2}

Formulae

uniformly accelerated motion,	s	=	$ut + \frac{1}{2}at^2$
	v^2	=	$u^2 + 2as$
work done on/by a gas,	W	=	$p\Delta V$
hydrostatic pressure,	p	=	ρgh
gravitational potential,	ϕ	=	$-Gm/r$
temperature,	T/K	=	$T/^{o}$C + 273.15
pressure of an ideal gas,	p	=	$\frac{1}{3}\frac{Nm}{V}<c^2>$
mean translational kinetic energy of an ideal gas molecule,	E	=	$\frac{3}{2}kT$
displacement of particle in s.h.m.,	x	=	$x_0 \sin \omega t$
velocity of particle in s.h.m.,	v	=	$v_0 \cos \omega t$
		=	$\pm\omega\sqrt{x_o^2 - x^2}$
electric current,	I	=	$Anvq$
resistors in series,	R	=	$R_1 + R_2 + \ldots$
resistors in parallel,	$1/R$	=	$1/R_1 + 1/R_2 + \ldots$
electric potential,	V	=	$\frac{Q}{4\pi\varepsilon_o r}$
alternating current / voltage,	x	=	$x_0 \sin \omega t$
magnetic flux density due to a long straight wire,	B	=	$\frac{\mu_0 I}{2\pi d}$
magnetic flux denxity due to a flat circular coil,	B	=	$\frac{\mu_0 NI}{2r}$
magnetic flux density due to a long solenoid,	B	=	$\mu_0 nI$
radioactive decay,	x	=	$x_0 \exp(-\lambda t)$
decay constant,	λ	=	$\frac{\ln 2}{t_{\frac{1}{2}}}$

1 A power station generates power at 3.0 GW.

What is the energy produced for a time interval of 2.0 ps?

A 6.0×10^{-15} TJ **B** 6.0×10^{-6} MJ

C 6.0×10^{3} nJ **D** 6.0×10^{6} μJ

2 A stone is thrown at a velocity of 12 m s^{-1} at an angle of 25° above the horizontal. What is the magnitude of the change in velocity from its starting point to the highest point in its path?

A 1.1 m s^{-1} **B** 5.1 m s^{-1} **C** 5.8 m s^{-1} **D** 12 m s^{-1}

3 The acceleration of free fall on Earth is six times of that on Moon.

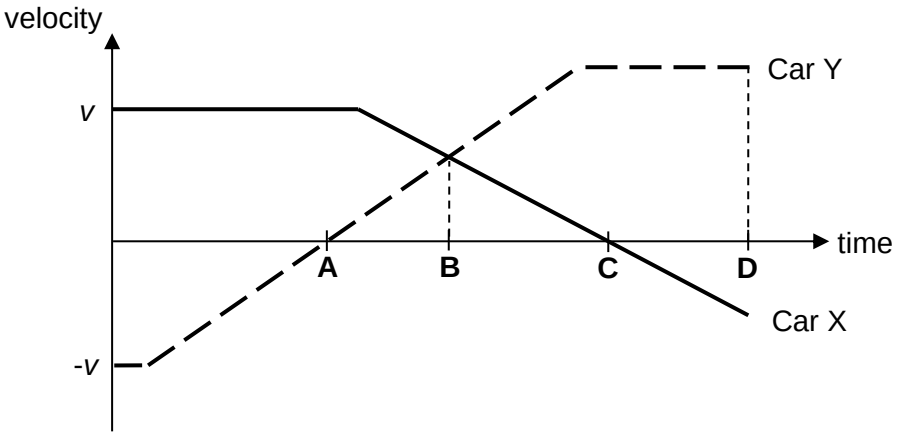
It takes time *t* for a rock on Moon to fall a distance of 3.0 m from rest.

What is the time taken for a rock on Earth to fall a distance of 2.0 m from rest?

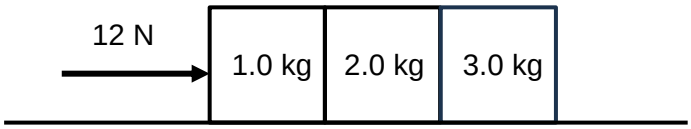
A $\frac{t}{9}$ **B** $\frac{t}{4}$ **C** $\frac{t}{3}$ **D** $\frac{t}{2}$

4 Car X and Car Y are at a distance apart and they move towards each other with the same initial speed *v*.

The graph shows the variation of the velocity of the cars with time. At which time are the cars at their distance of closest approach?



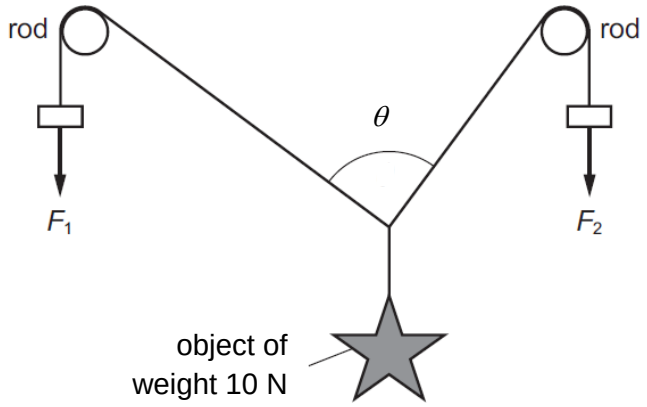
5 Three blocks, of masses 1.0 kg, 2.0 kg and 3.0 kg, are initially at rest on a frictionless surface and are in contact with each other as shown. A 12 N force is then applied on the 1.0 kg block.



Which row shows the respective magnitudes of the normal contact force exerted by the 1.0 kg block on the 2.0 kg block and the normal contact force exerted by the 2.0 kg block on the 3.0 kg block?

	normal contact force of 1.0 kg on 2.0 kg block	normal contact force of 2.0 kg on 3.0 kg block
A	4.0 N	6.0 N
B	6.0 N	10 N
C	10 N	6.0 N
D	12 N	12 N

6 An object hangs by means of two cords around two rods, as shown.



The object is held in equilibrium by the forces F_1 and F_2. The object weighs 10 N. There is negligible friction between the rods and the cords.

Which row of the table gives an angle θ of 90° ?

	F_1 / N	F_2 / N
A	4.0	6.0
B	6.0	4.0
C	6.0	8.0
D	8.0	6.0

7 A block of ice of density 0.90 g cm^{-3} is held below the surface of water of density 1.0 g cm^{-3}. The block of ice is then released and floats to the surface.

What is the ratio $\frac{\text{upthrust when fully submerged}}{\text{upthrust when floating}}$?

A 0.1 **B** 0.9 **C** 1.0 **D** 1.1

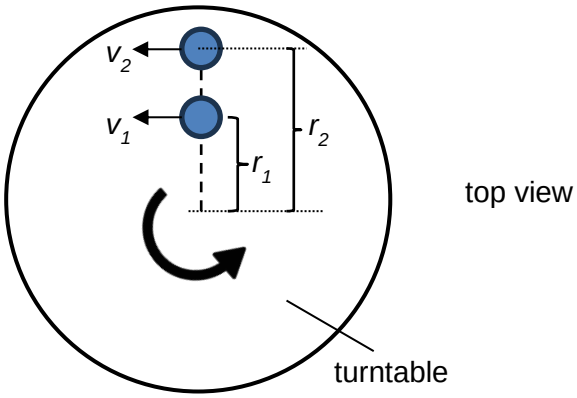
8 A speed boat with two engines, each of power output of 36 kW, can travel at a maximum speed of 12 m s^{-1}. The total drag D on the boat is related to the speed v of the boat by the equation shown.

$$D \propto v^2$$

What is the maximum speed of the boat when only one engine is working?

A 3.0 m s^{-1} **B** 6.0 m s^{-1} **C** 8.5 m s^{-1} **D** 9.5 m s^{-1}

9 Two identical coins rest on a horizontal turntable undergoing uniform circular motion at distances r_1 and r_2 from the centre of the turntable as shown.



Which row shows the correct ratio of angular velocities $\frac{\omega_1}{\omega_2}$ and linear velocities $\frac{v_1}{v_2}$?

	$\frac{\omega_1}{\omega_2}$	$\frac{v_1}{v_2}$
A	1	$\frac{r_1}{r_2}$
B	1	$\frac{r_2}{r_1}$
C	$\frac{r_1}{r_2}$	1
D	$\frac{r_2}{r_1}$	1

10 A man is in a space station orbiting the Earth. He experiences weightlessness because

A he is too far from the Earth. The gravitational forces acting on him are negligible.

B the contact force with the space station is equal and opposite with his weight.

C the centripetal force balances his weight, causing him to experience no net force.

D his weight acts as the centripetal force, he is not in contact with the space ship.

11 A satellite orbiting the Earth is moved from one stable orbit to another with a smaller radius.

Which statement is true?

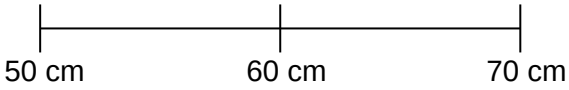
A The linear speed of the satellite increases.

B The angular speed of the satellite remains constant.

C The gravitational force acting on the satellite decreases.

D The gravitational potential energy of the satellite increases.

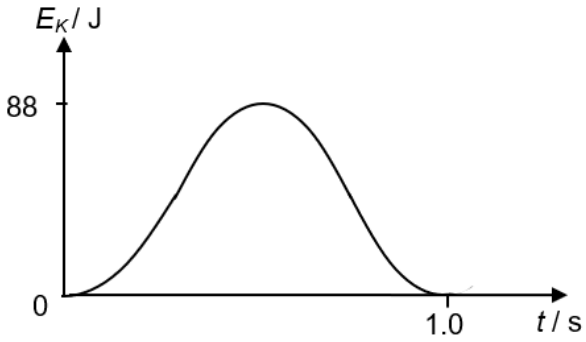
12 A particle oscillating in simple harmonic motion has its motion timed at t = 0 s when it is at the 50 cm mark. It travels between the 50 cm and the 70 cm marks with a period of 2.0 s as shown below.



Where is the position of the particle at time t = 1.25 s?

A 57 cm **B** 63 cm **C** 65 cm **D** 67 cm

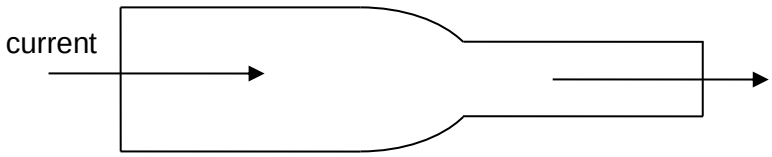
13 A particle of mass 3.0 kg undergoes simple harmonic motion. The graph below shows the variation with time t of its kinetic energy E_K.



What is the maximum acceleration of the particle?

A 12 m s^{-2} **B** 24 m s^{-2} **C** 36 m s^{-2} **D** 48 m s^{-2}

14 The figure below shows the top view of a metal strip of uniform thickness. The width of the narrow section is half the width of the wide section.



Which of the following statements is correct?

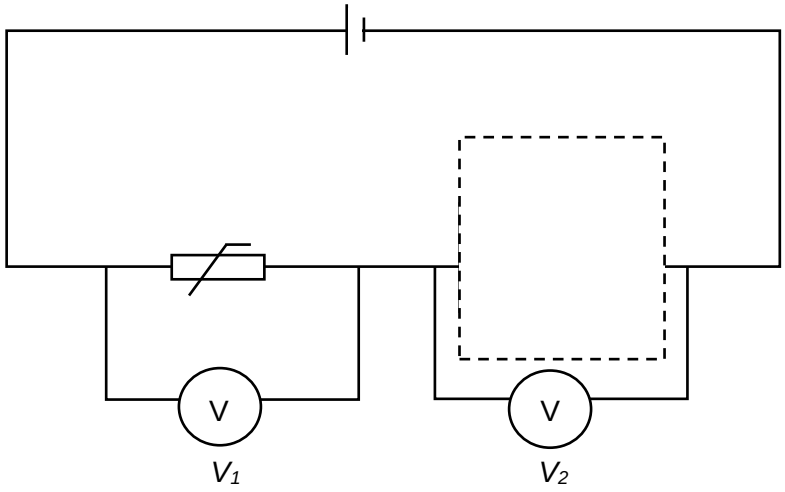
A The potential difference per unit length of the narrow section is the same as the potential difference per unit length of the wide section.

B The potential difference per unit length of the narrow section is smaller than the potential difference per unit length of the wide section.

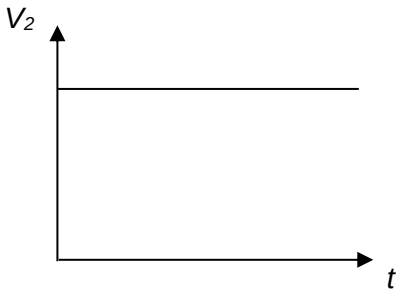
C The resistance per unit length of the narrow section is twice that of the wide section.

D The resistance of the narrow section will be smaller and hence more current will flow through as compared to the wide section.

15 An electrical circuit as shown is set up as shown.

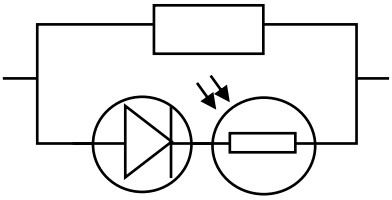


The temperature was decreased and the intensity of light increased. The variation of V_2 with time t is as shown.

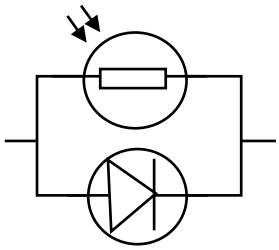


Which of the following could have been a possible set up in the dotted box?

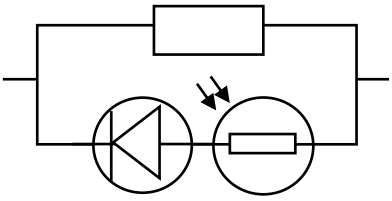
A



B



C



D