Candidate's Name …… CTG ….....

YISHUN JUNIOR COLLEGE
2015 JC 1 BLOCK TEST

PHYSICS **9646/1**
HIGHER 2 **11 June 2015**
Paper 1 **Thursday**
40 minutes

Additional Materials:
Optical Mark Sheet

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name and CTG on the Optical Mark Sheet in the spaces provided. Shade your NRIC in the space provided.

There are **twenty** questions in 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 Optical Mark Sheet.

Read the instructions on the Optical Mark Sheet carefully.

INFORMATION FOR CANDIDATES

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.

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	=	$\rho g h$
gravitational potential,	ϕ	=	$-\frac{Gm}{r}$
Displacement of particle in s.h.m.	x	=	$x_o \sin \omega t$
velocity of particle in s.h.m.,	v	=	$v_o \cos \omega t$
		=	$\pm \omega \sqrt{(x_o^2 - x^2)}$
resistors in series,	R	=	$R_1 + R_2$+…….
resistors in parallel,	$\frac{1}{R}$	=	$\frac{1}{R_1} + \frac{1}{R_2} + ...$
electric potential,	V	=	$\frac{Q}{4\pi\varepsilon_o r}$
alternating current/voltage,	x	=	$x_o \sin \omega t$
transmission coefficient	T	=	$\exp(-2kd)$
where k		=	$\sqrt{\frac{8\pi^2 m(U-E)}{h^2}}$
radioactive decay,	x	=	$x_o \exp(-\lambda t)$
decay constant,	λ	=	$\frac{0.693}{t_{\frac{1}{2}}}$

1 A measurement is said to be precise if its random error is small. A measurement is said to be accurate if its systematic error is small.

A student wants to measure the mass of standard weights commonly used in the laboratory with the non-electronic beam balance. He decided to use a sensitive balance with good technique but a defective (chipped) set of weights. Which statement about his measurements is correct?

A It is precise and accurate.

B It is precise and not accurate.

C It is not precise but accurate.

D It is not precise and not accurate.

2 A boat was travelling towards the East. It then travels towards the North. What is the direction of the change in velocity?

A North-East

B South-East

C North-West

D South-West

3 A ball is thrown into the air and follows a parabolic trajectory. At the highest point in the trajectory,

A the velocity is zero, but the acceleration is not zero.

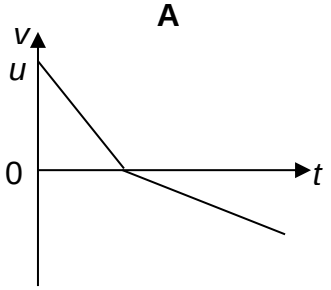
B both the velocity and the acceleration are zero.

C the acceleration is zero, but the velocity is not zero.

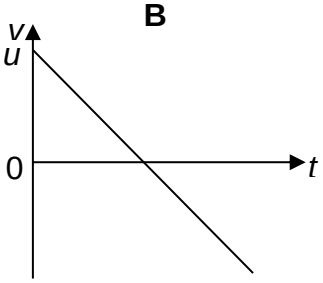
D neither the acceleration nor the velocity is zero.

4 A ball is thrown upwards with an initial velocity u.
Which of the following graphs show the relationship of the ball's velocity v with time t if air resistance **cannot** be ignored?

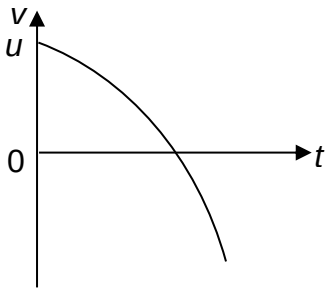
A



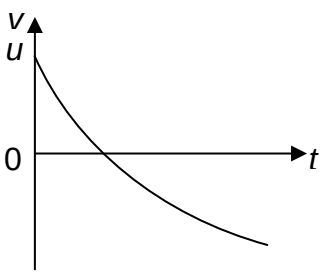
B



C



D



5 A 70 kg hunter pulls a loaded sled of mass 350 kg towards him with a constant force. Both are initially at rest, 30 m apart on a frictionless and level ice surface. When the sled reaches the hunter, what distance would the sled have moved?

A 5 m **B** 6 m **C** 15 m **D** 25 m

6 A tennis ball falls vertically, bounces on the ground and finally comes to a rest. The following statements are about the forces acting while the tennis ball is in contact with the ground.

Which statement is correct?

A The force that the ball exerts on the ground is always equal to the weight of the ball.

B The force that the ball exerts on the ground is always greater than the weight of the ball.

C The force that the ball exerts on the ground is always equal in magnitude and opposite direction to the force the ground exerts on the ball.

D The force that the ground exerts on the ball is always equal and opposite to the weight of the ball.

7 A parachutist of mass 70 kg descends vertically at a constant velocity of 4.0 m s^{-1}.

What is the net force acting on him?

A 280 N downwards

B 690 N upwards

C 690 N downwards

D zero

8 A trolley runs down a slope with a constant acceleration *a*. The mass of the trolley is now tripled and the trolley is allowed to run down the same slope. In both cases, effects of friction and air resistance are negligible.

Which statement is correct for the second experiment?

A The accelerating force is the same.

B The acceleration is $\frac{1}{3}a$.

C The acceleration is *a*.

D The acceleration is 3*a*.

9 A 0.50 kg ball moving towards the right at a constant speed of 3.0 m s^{-1} hits against a wall and rebounds in the opposite direction. Given that the speed after the rebound is 2.0 m s^{-1} and that the ball is in contact with the wall for 4.0 ms, what is the force exerted by the wall on the ball?

	magnitude of force	direction of force
A	130 N	towards the left
B	130 N	towards the right
C	630 N	towards the left
D	630 N	towards the right

10 Which of the following is false about the forces acting on a submarine which is travelling half-submerged in water?

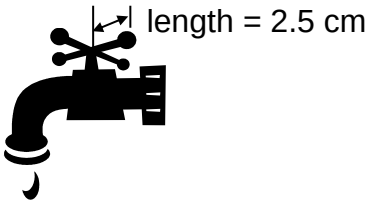
A The force exerted by Earth on the submarine is equal in magnitude as the force exerted by the submarine on Earth.

B The total downward force exerted on the submarine by air equals to the total upward force exerted by the water.

C The weight of the submarine is equal in magnitude to the weight of the water displaced by the submarine.

D The drag force experienced at the top is smaller than the drag force experienced at the bottom of the submarine.

11 What is the torque exerted on turning a tap if force is exerted on all four spokes of the tap and the force on each spoke is equal to 10 N?



A 0.25 N m **B** 0.50 N m **C** 0.75 N m **D** 1.0 N m

12 Which of the following motion exhibits equilibrium?

A A rocket travelling in a straight line in space at constant speed.

B A spinning top gradually slowing down.

C A ball rolling down a rough slope at constant acceleration.

D A soccer ball at the height of its trajectory ($v_y = 0$).

13 An object, immersed in a liquid, experiences upthrust. What is the physical reason behind it?

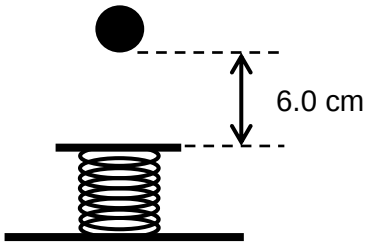
A The density of the body differs from that of the liquid.

B The density of the liquid increases with depth.

C The pressure of the liquid increases with depth.

D The value of g (acceleration of free fall) changes as the depth increases.

14 A 0.50 kg ball is released from a height of 6.0 cm above a spring with a spring constant of 300 N m^{-1}. What is the maximum compression of the spring as the ball compresses the spring and comes to a stop?



A 1.6 cm

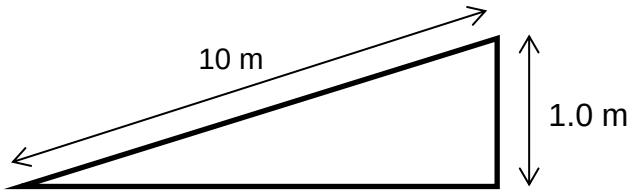
B 3.1 cm

C 4.4 cm

D 6.4 cm

15 A driving force of 400 N is needed for a car of mass 1000 kg to travel along a level road at a speed of 20 m s^{-1}.

What power is required to maintain the car at this speed up a slope in which the car rises 1.0 m for each 10 m of travel along the road? Assume that the car experiences the same frictional force on the level road and sloped road.



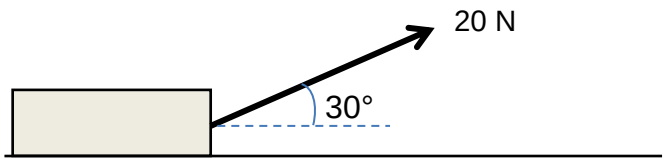
A 8.0 kW

B 11 kW

C 28 kW

D 200 kW

16 A box, initially at rest, is pulled by a force of 20 N at an angle of 30° above the horizontal, as shown. The box is being pulled over a distance of 5.0 m.



If 15 J of heat is generated on the ground over the distance of 5.0 m, what is the kinetic energy of the box at the end of 5.0 m?

A 35 J

B 72 J

C 85 J

D 87 J

17 A 0.30 kg mass is raised through a height of 9.0 m in 4.0 s by an electric motor. If the efficiency of the motor is 70%, how much electrical energy is needed?

A 0.96 W

B 4.6 W

C 6.6 W

D 9.4 W

18 An object rotates in a vertical circle with a constant speed. Which of the following quantities is not constant with time?

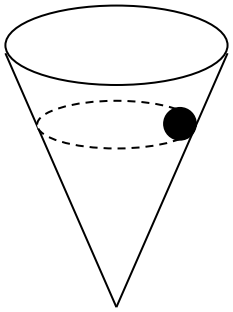
A Kinetic energy

B Gravitational potential energy

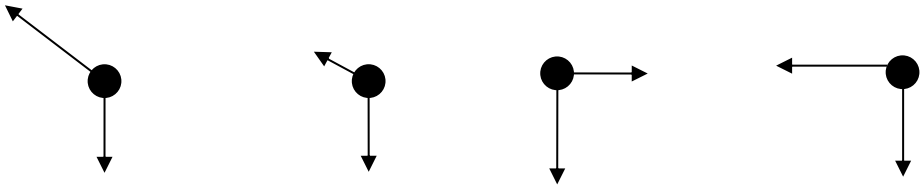
C Angular velocity

D Period

19 Consider a ball rolling around in a circular path on the smooth inner surface of a cone.



Which of the following correctly shows the magnitude and direction of the forces acting on the ball at this instant?



A **B** **C** **D**

20 A mass is attached to a string and rotates about a fixed centre at angular velocity ω on a smooth horizontal table. The string carries a tension T throughout the circular motion.

If the length of the string is doubled and its angular velocity is halved, which of the following is its new tension?

A $\frac{T}{2}$ **B** $\frac{T}{4}$ **C** T **D** $4T$

– End of paper –

Answer Key

1. B
2. C
3. D
4. D
5. A
6. C
7. D
8. C
9. C
10. B
11. D
12. A
13. C
14. D
15. C
16. B
17. D
18. B
19. A
20. A