Physics Preliminary exam

- 70 marks, 2 hours 30 mins

Multiple Choice

Question 1)

A car strikes another car resulting in the cars sticking together

1. This is a perfectly elastic collision where both Kinetic energy and momentum before and after are conserved
2. This is a perfectly elastic collision where momentum before and after are conserved
3. This is a perfectly inelastic collision where both Kinetic energy and momentum before and after are conserved
4. This is a perfectly inelastic collision where momentum before and after is conserved

Question 2)

Which of the following will result in a point charge accelerating

1. Placing an electron in a magnetic field
2. Placing a neutron in a magnetic field
3. Placing an electron in an electric field
4. Placing a neutron in an electric field

Question 3)

How many forces are acting on a wooden cube placed on an inclined plane

1. 1
2. 2
3. 3
4. 4

Question 4)

A scientist notices a wah – wah sound when he plays two frequencies of 404 Hz and 406 Hz at the same time. What is the name of this phenomena

1. The wah-wah effect
2. The doppler effect
3. Booms
4. Beats

Question 5)

An ambulance is travelling towards an observer at a constant velocity. It is emitting a sound of constant frequency. How will the pitch change as it gets closer.

1. It will get higher due to the doppler effect
2. It will get lower due to the doppler effect

3. The pitch will not change since the ambulance is not accelerating
4. The pitch will get lower due to the wah-wah effect

Question 6)

The following velocity vs time graph applies to a car.

What can you deduce about its motion

1. It is starting from rest and accelerating
2. It is accelerating at a constant rate
3. It is traveling at constant velocity
4. It is accelerating at an accelerating rate

Question 7)

A moon dog weighs 5 kg on the moon, the acceleration due to gravity is 1.6 m/s/s. What is their weight on earth.

1. 5 kg
2. 30.6 kg
3. 3.1 kg
4. 9.8 kg

Question 8)

During a game of tug of war, the winning team accelerate at 10 m/s/s. If the losing team applied a force of 200 N and both teams weigh 100 kg, what force did the other team apply?

1. 1200 N
2. 1000 N
3. 120 N
4. 100 N

Question 9)

When a book is placed on a wooden table, the table pushes back preventing it from falling to the ground. Which one of Newton's law is at play?

1. Newton's zeroth law
2. Newton's first law
3. Newton's second law
4. Newton's third law

Question 10)

If light is reflected off a surface with a refractive index of 1.4. The angle of incidence is 45 degrees. What is the angle of the reflected light

1. 63
2. 32
3. 1.4
4. 45

Short Answers

Question 16) (5 marks)

A fisherman is stuck at sea. He wants to calculate the velocity of the wind which is approximate equal to the velocity of the waves. Devise a method he could use to determine the velocity of the wind.

Question 21) (6 marks)

Evaluate the usefulness of models in science using an example [6 marks]

Question 22) (8 marks)

a)

Explain what the phenomena of beats is [2 marks]

b)

Explain what the doppler effect is and how it affects the frequency of sound [2 marks]

c)

A train is moving towards a stationary wall, it is emitting sound of a single frequency. This sound rebounds back off the wall. An observer next to the sound source on the train can hear both the sound of the source and the sound thats travelled to the wall and back. What phenomenons are observed? [4 marks]

Question 23) (6 marks)

a)

Explain how light can travel through a vacuum, however, sound can not. [3 marks]

b)

Outline an experiment you performed to demonstrate this. [3 marks]

Question 24) (8 marks)

A 2 kg box is at rest on an incline plane due to friction at an incline of 30 degrees.

1. Is this scenario involving static or dynamic friction? (1 mark)
2. Draw a diagram containing the net forces acting on the box (3 marks)
3. Calculate the force of friction (hint: remember to include direction and magnitude) (4 marks)

Question 25) (6 marks)

Explain kirchhoff's law using a diagram of an electric circuit

Question 26) (5 marks)

A helium nucleus (2 protons and 2 neutrons) is placed in an electric field. The voltage of the plates creating this charge are 4 V and the plates are spaced 30 cm apart. What is the acceleration of the helium nucleus?

Question 27 (10 marks)

A student wishes to determine the static friction coefficient of phone case using an inclined plane, they can change the slope of the inclined plane.

1. What are the independent, dependent and controlled variables? [3 marks]
2. Contrast static and dynamic friction [3 marks]
3. Explain the experimental set up, with a diagram, you would use in this investigation [4 marks]

Question 28) (6 marks)

An opera singer is singing into a wine glass, resulting in the wine glass shattering. Explain why this occurs and what is required for this to occur using the concept of simple harmonic motion