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Set A

Practice Paper 2

PHYSICS

IB SL

EXAM PAPERS PRACTICE

Practice Paper 2

Question Paper

Course	DP IB Physics
Section	Set A
Topic	Practice Paper 2
Difficulty	Medium

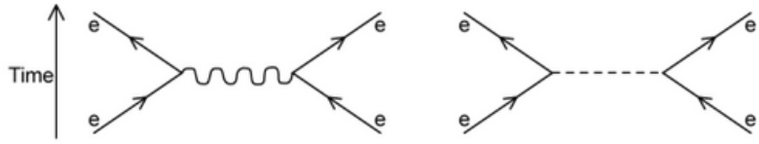
Time allowed: 60

Score: /50

Percentage: /100

Question 1a

The Feynmann diagrams show two electroweak interactions between electrons. One of the exchange particles is a photon.



a)

(i)

Identify the other exchange particle which isn't a photon

[1]

(ii)

Outline one difference between the two exchange particles

[1]

[2 marks]

Question 1b

b)

Outline how interactions in particle physics are understood in terms of exchange particles.

[2 marks]

Question 1c

(c)

Describe the significance of the Higgs Boson in the standard model of quarks and leptons.

[2 marks]

Question 1d

The discovery of the Higgs Boson marked a huge accomplishment for particle physicists.

It was first hypothesised by Peter Higgs and his team in 1964 and then discovered by a large collaborative effort at the CERN particle physics laboratory much later in 2012.

(d)
Explain what is meant by the term 'hypothesised' and suggest why it took over forty years to discover the Higgs Boson.

[3 marks]

Question 2a

A motor is used to lift a 50 kg mass from rest up a vertical distance of 18 m in 0.3 minutes.

(a)
Calculate the minimum power requires to the lift the mass.

[3 marks]

Question 2b

(b)
Explain why the power of the motor is only a minimum.

[2 marks]

Question 2c

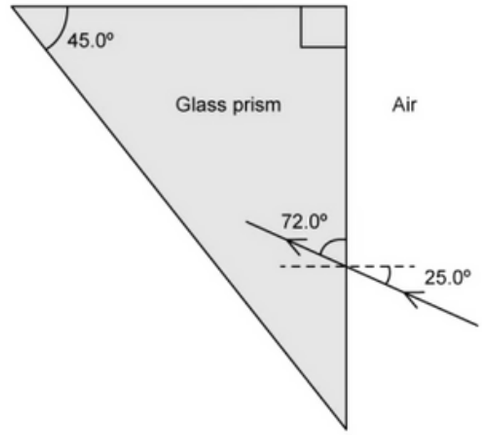
A different motor is used to lift an identical mass through the same distance in the same amount of time with an overall efficiency of 38 %. The mass experiences a resistive force of 170 N.

(c)
Calculate the work required from the motor.

[3 marks]

Question 3a

A ray of light passes from air into a glass prism.



As the light ray passes through the prism, it emerges back into the air.

(a)
Calculate the critical angle from the glass to the air.

[2]

[2 marks]

Question 3b

(b)

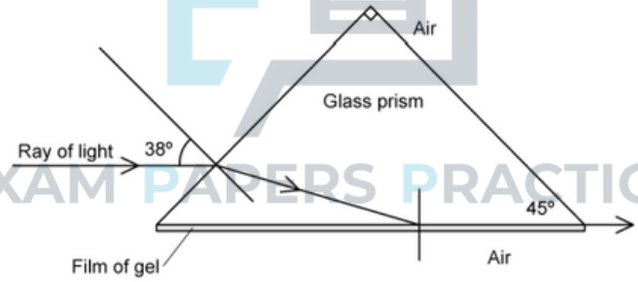
On the diagram from part (a), draw the continuation of the path of the ray of light until it emerges back into the air, labelling the values of the angles between the ray and any normals.

[2]

[2 marks]

Question 3c

The prism is rotated and one side is coated with a film of transparent gel. A ray of light strikes the prism, at an angle of incidence of 38°, and continues through the glass to strike the glass–gel boundary at the critical angle.



(c)

Calculate the refractive index of the gel.

[3]

[3 marks]

Question 3d

A ray of light now strikes the prism at an angle of incidence which means that it now refracts straight through the gel at the glass–gel boundary.

(d)
Without calculation, explain how the critical angle for the glass–gel boundary differs from the critical angle for the gel–air boundary.

[2]

[2 marks]

Question 4a

(a)
State what is meant by an ideal gas.

[1]

[1 mark]

Question 4b

(b)
State the conditions for a real gas to approximate to an ideal gas.

[3]

[3 marks]

Question 4c

(c)
Describe how the ideal gas constant, *R*, is defined.

[2]

[2 marks]

Question 4d

The graphs shows how pressure, *p*, varies with absolute temperature, *T*, for a fixed mass of an ideal gas.

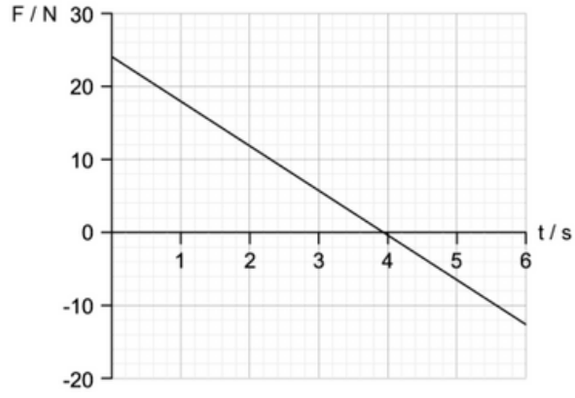
(d)
Outline the changes, or otherwise, to the volume and density of the ideal gas as the absolute temperature increases.

[2]

[2 marks]

Question 5a

The force acts on a mass of 5.0 kg initially at rest.



(a)

Show that the speed of the mass at $t = 3$ s is 8.4 m s^{-1}.

[4 marks]

Question 5b

(b)

Calculate the deceleration of the mass up to time $t = 4$ s.

[3 marks]

Question 5c

(c)
Calculate the total impulse experienced by the mass.

[3 marks]

Question 6a

An industrial kiln is used for 'firing' ceramic and pottery items at very high temperatures.

The kiln emits electromagnetic radiation of peak wavelength, $\lambda_{max} = 3.75 \times 10^{-6}$ m and has a surface area of 150 m^2.

(a)
Calculate the energy radiated per second.

[3]

[3 marks]

Question 6b

(b)
Justify each of the following safety features in the kiln by referring to thermal energy transfer.

(i)
The installation of chimneys and vents.

[1]

(ii)
Air space created below and around the kiln.

[1]

(iii)
Shiny reflective surfaces fixed around the inside of the exterior walls.

[1]

[3 marks]