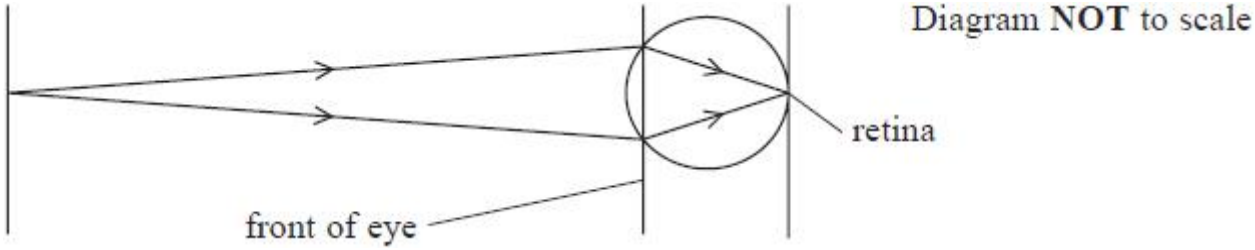
Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

The human eye acts as a converging lens system that produces an image on the retina at the back of the eye as shown.



A person with eyesight problems may wear either diverging or converging contact lenses.

A short-sighted eye cannot focus on distant objects, because the power of the eye is too great.

One student with short sight cannot focus on objects further than 1.5 m without wearing her contact lenses.

To view distant objects, it is determined that the combined power of her eye and her contact lens should be 41.7 D.

Determine the power and type of lens needed to correct her vision. Assume the equations for thin lens apply to both lenses.

distance from eye lens to retina = 2.4 cm

(4)

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Power = ...

Type of lens .....

(Total for question = 4 marks)

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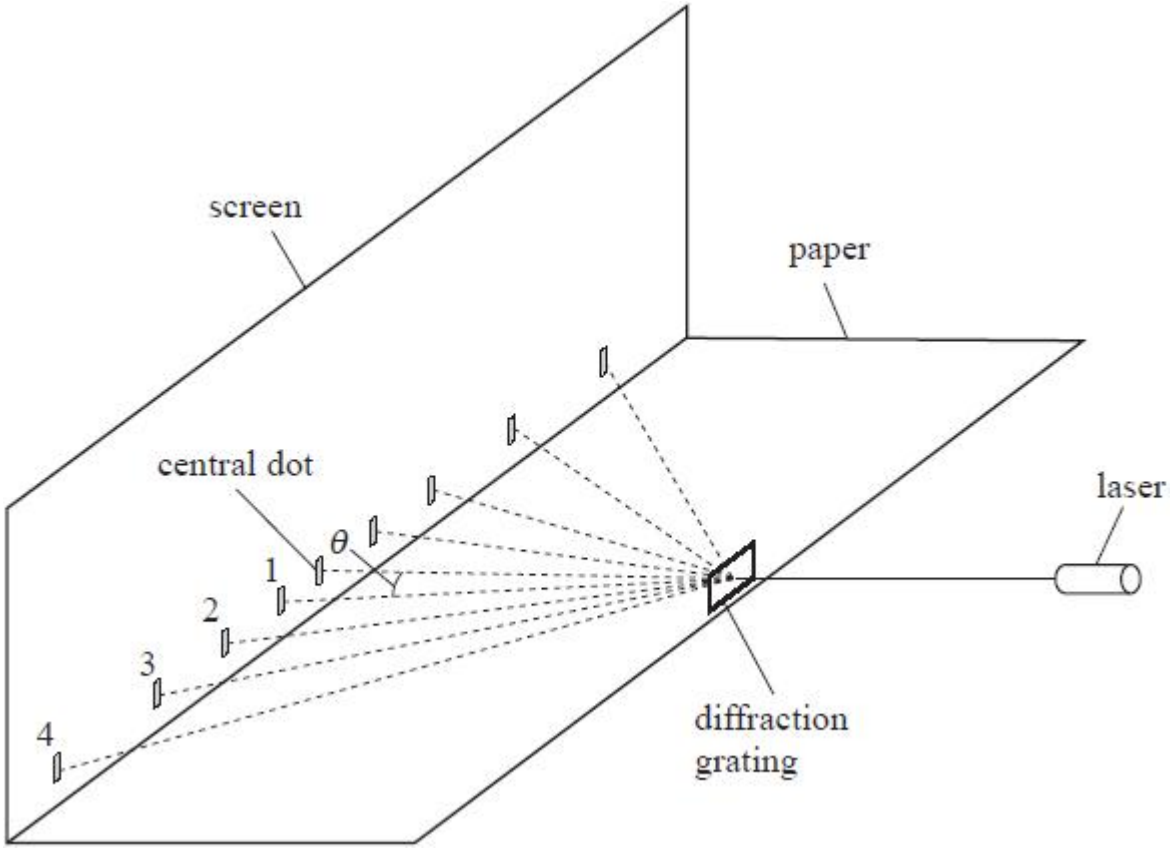
Q2.

The arrangement shown was used to determine the wavelength of light emitted by a laser.



A laser light beam was shone at a diffraction grating. A series of dots of light was produced on a screen. The angles θ between the light ray to the central dot and the light rays to the dots labelled 1 to 4 were measured with a protractor.

n	θ / °	$\sin\theta$
1	12	0.21
2	23	0.39
3	34	0.56
4	51	0.78

The diffraction grating has 300 lines mm^{-1}.

Determine the wavelength of the laser light.

(4)

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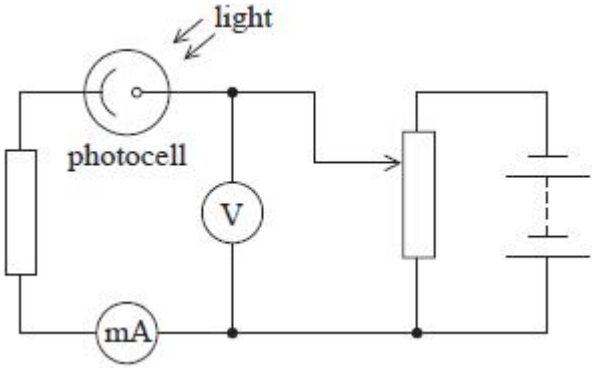
Wavelength = ...

(Total for question = 4 marks)

Q3.

A student has been learning about the photoelectric effect.

The student sets up a circuit to investigate the photoelectric effect.



The student illuminates the photocell with light of known frequency *f*. A current is produced in the circuit due to the emitted electrons. He adjusts the potential difference, using a potential divider, until the reading on the milliammeter is zero and records the corresponding reading V_s on the voltmeter. He repeats this procedure for other frequencies of light.

When the reading on the milliammeter is zero the maximum kinetic energy of the emitted electrons is given by eV_s.

Explain how the student can use his results to determine a value for the Planck constant *h* using a graphical method.

(5)

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(Total for question = 5 marks)

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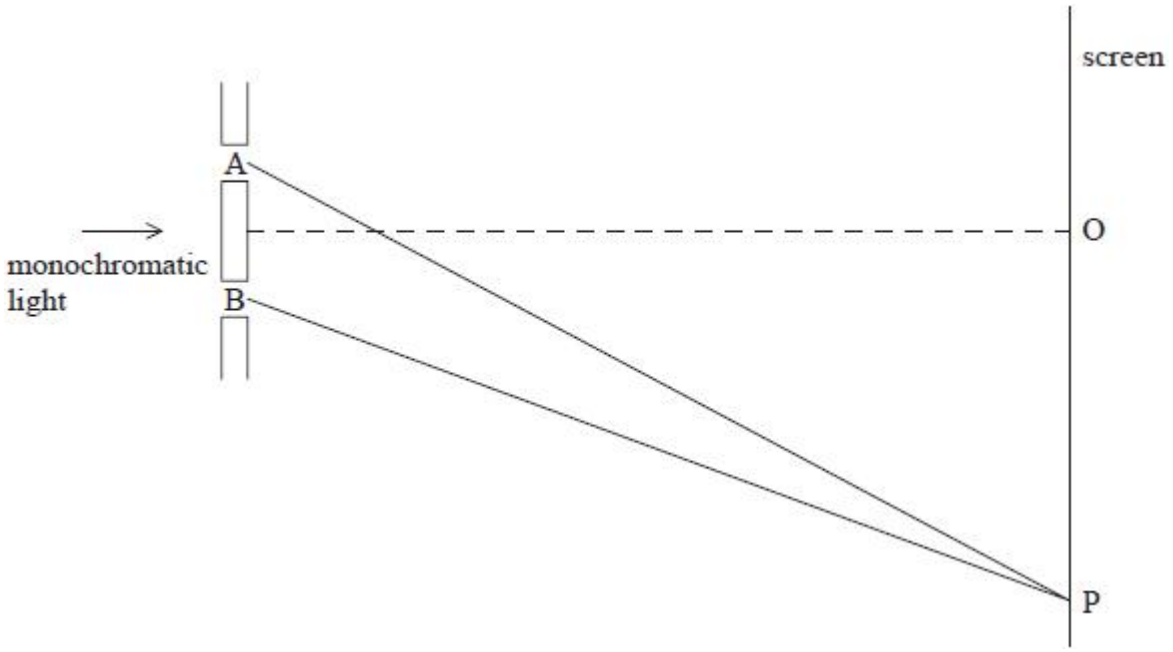
Q4.

The experiment was carried out with laser light of wavelength 600 nm. The diagram below shows two paths taken by the light after it has passed through the two slits A and B. The diagram is not to scale.



(i) Point O is a point equidistant from the two slits.
Explain why there is a bright line at this point.

(3)

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(ii) The next bright line is observed on the screen at point P. Lines AP and BP show the path of the light from each slit to the screen at P.
State the difference in the lengths of the paths AP and BP.

(1)

Difference in lengths of paths = ...

(Total for question = 4 marks)

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