FUKIEN SECONDARY SCHOOL

S3 Final Examination (2020-2021)

Physics

(1 hour)

Date: 7th June 2021 Name: _____

Time: 10:00 a.m. – 11:00 a.m. Class: _____ No.: _____

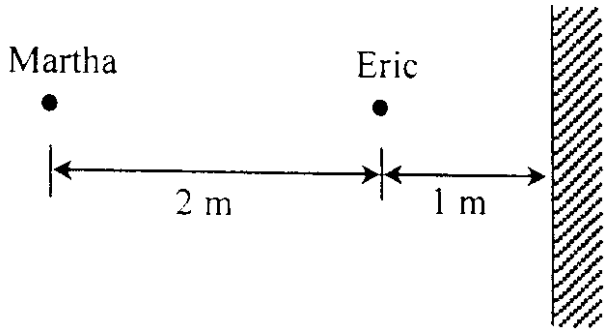
Instructions to students:

1. Write your name, class and class number on both the question paper and the answer sheets.
2. Answer ALL questions.
3. Write down all the answers on the answer sheets.
4. Hand in the question paper and the answer sheets at the end of the examination.
5. The total mark of the paper is 60.
6. The paper consists of two sections: Section A Multiple Choice Questions (20 marks) and Section B Structured Questions (40 marks).
7. The numerical answers should be either exact or correct to 3 significant figures.

Section A: Multiple Choice Questions (20 marks)

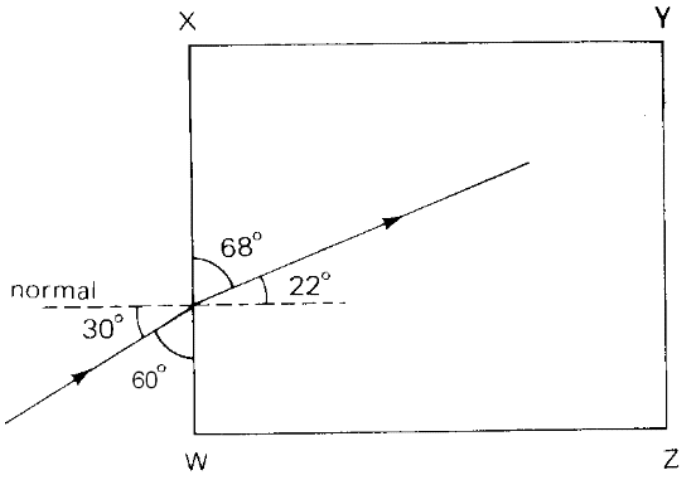
1. Eric stands 1 m in front of a plane mirror. Martha stands 2 m behind Eric as shown in the figure below. Find the distance between Eric and the image of Martha formed by the mirror.

   A. 2 m
   B. 3 m
   C. 4 m
   D. 6 m



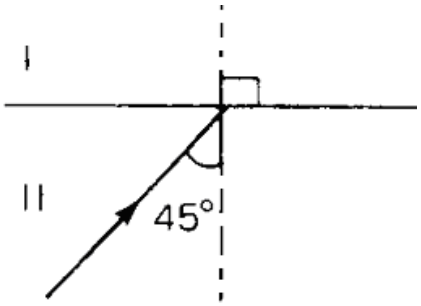
2. A ray of light travels through a glass block WXYZ as shown in the figure below. What is the refractive index of the glass block?

   A. 1.33
   B. 1.50
   C. 1.61
   D. 2.31



3. Light travels faster in medium I than in medium II. The critical angle between the two media is 50°. Which light ray in the following diagram will undergo total internal reflection?

A.



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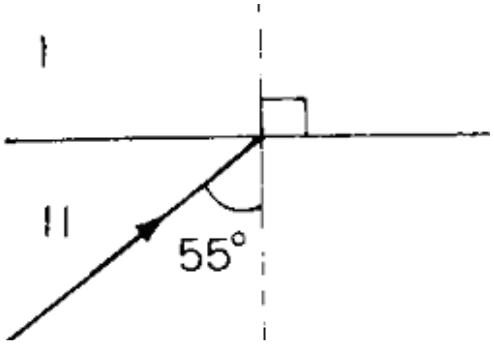

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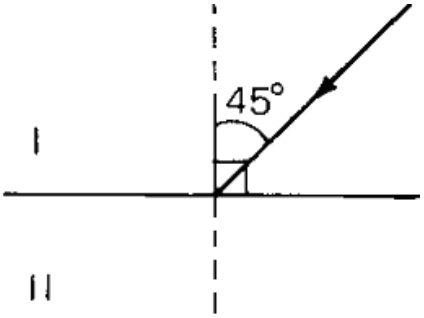
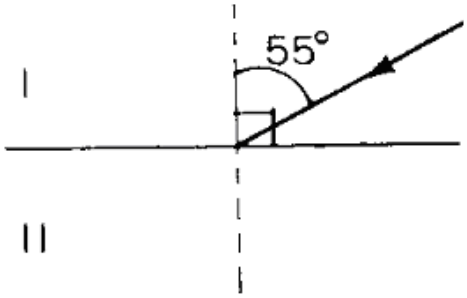
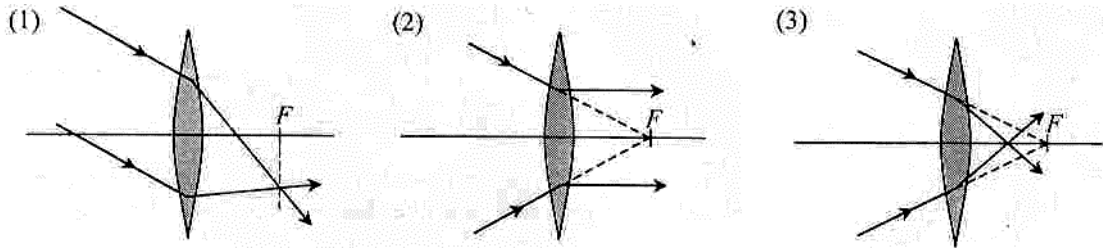


D.

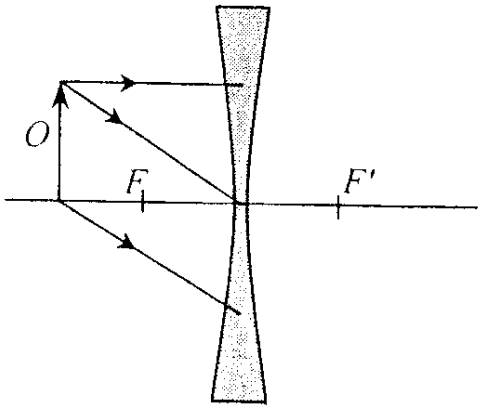


4. Which of the following ray diagrams concerning the refraction of light ray by a converging lens is/are INCORRECT? *F* denotes the focus of the lens.



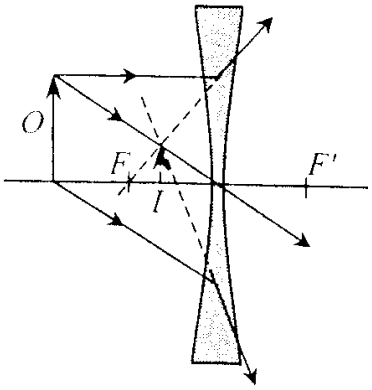
A. (2) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only

5. An object *O* is placed in front of a concave lens. *F* and *F*' are the foci of the lens.

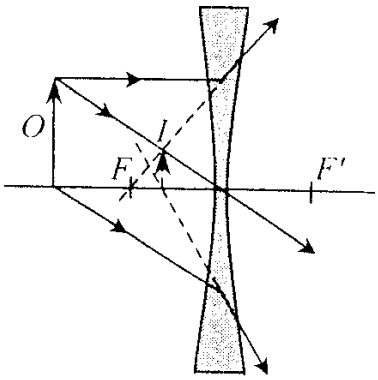


Which of the following diagrams shows the refracted rays of the three incident rays and the image *I* formed?

A.



B.



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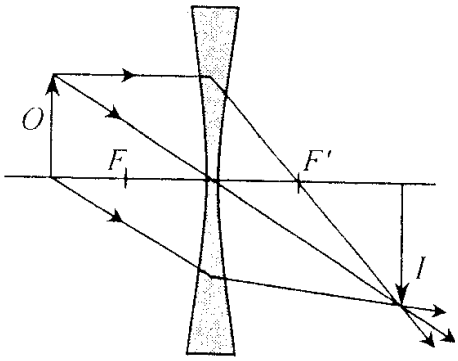
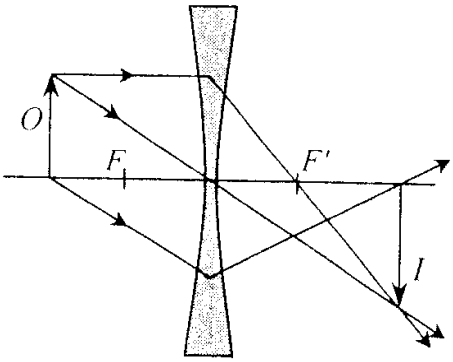
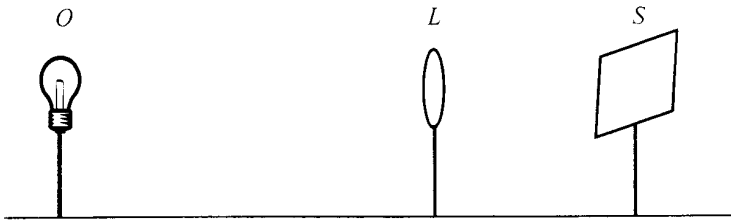


D.



6. A light bulb *O* is placed in front of a lens *L* as shown in the figure below. A sharp and diminished image is formed on the screen *S*.

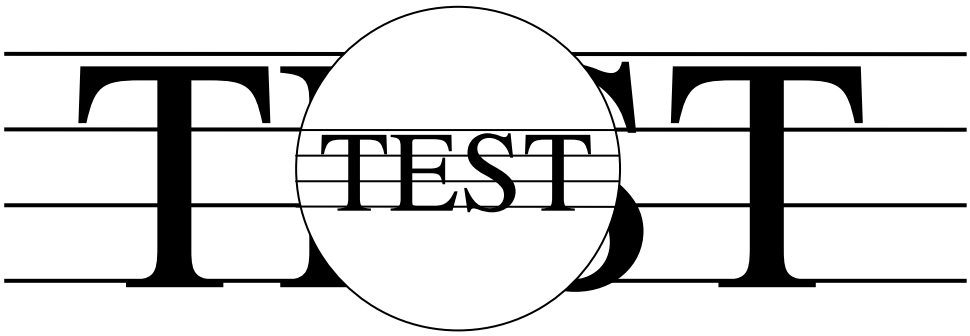


Which of the following statements is/are correct?

(1) The magnification is smaller than 1.
(2) The image is erect.
(3) The image is virtual.

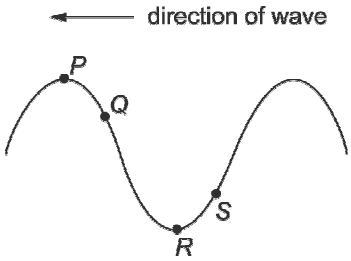
A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

7. A student puts a lens at a certain distance above a paper with the word "TEST" written on it as shown in the figure below. What type of lens is used? If the student moves the lens further away from the paper, how does the size of the image change?



	lens	**the size of the image**
A.	convex	becomes bigger
B.	convex	becomes smaller
C.	concave	becomes bigger
D.	concave	becomes smaller

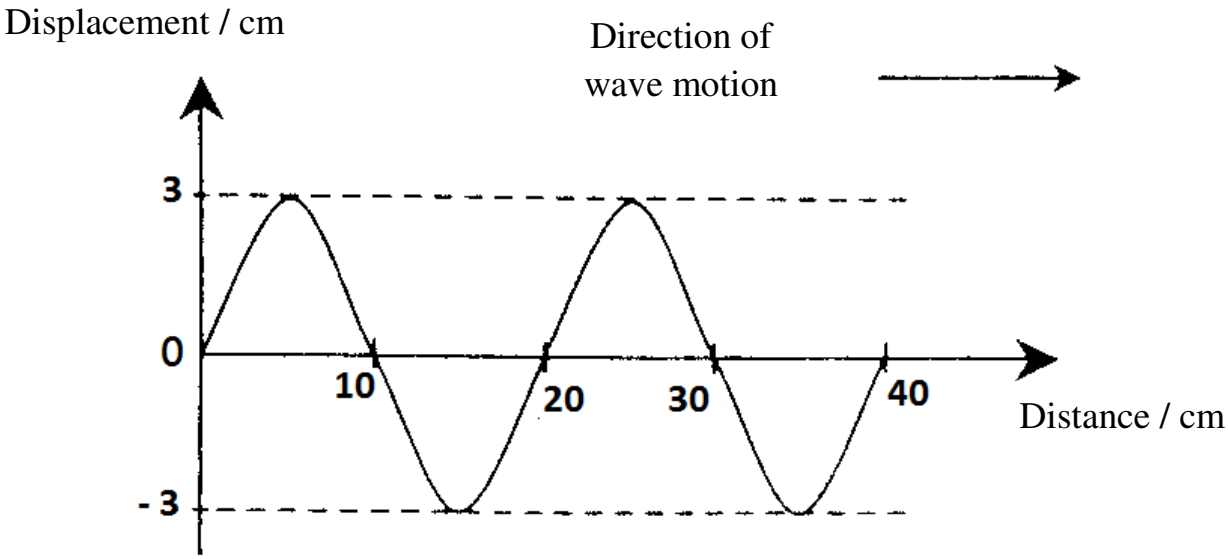
8. Which of the following statements about the water wave as shown in the figure below is/are correct?



(1) Particles *P* and *R* are moving to the left.
(2) Particle *S* is moving upwards.
(3) Particle *R* will move to the position of particle *P* after a half period of time.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

(For Questions 9 and 10) A transverse wave travels along a string with a speed of 1.2 ms^{-1}. The diagram below shows the shape of the string at a certain instant.

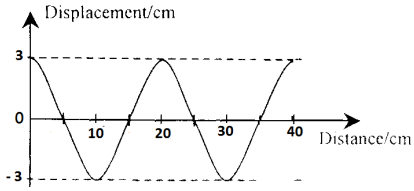


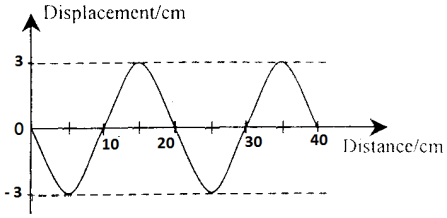
9. Which of the following statements about the transverse wave are correct?

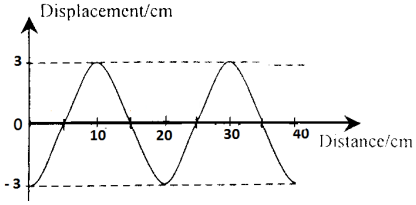
(1) Its wavelength is 10 cm.
(2) Its frequency is 6 Hz.
(3) Its amplitude is 3 cm.

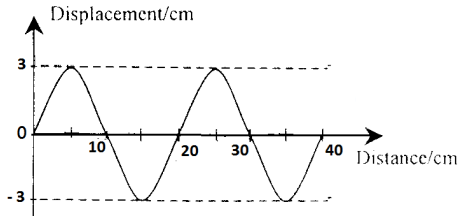
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

10. Which of the following diagrams shows the shape of the string after a half period of time?

A.


B.


C.


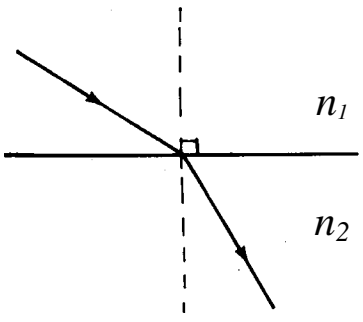
D.


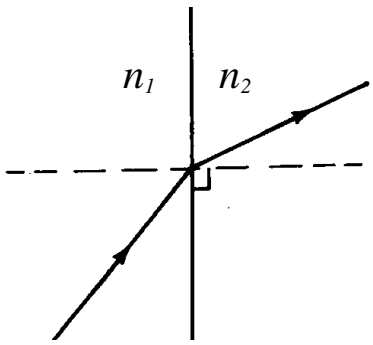
End of Section A

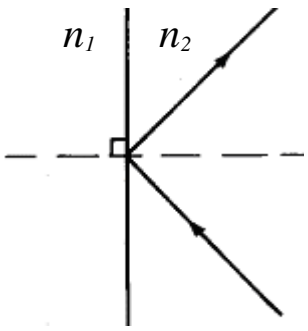
Section B: Structured Questions (40 marks)

1. Complete the path of rays on Figure 1a and Figure 1b on the answer sheet. (5 marks)

2. As shown in the figures below, a light ray passes from one medium to another in three cases. n_1 and n_2 are the refractive indices of the two media. State whether n_1 is greater than, equal to or smaller than n_2. (3 marks)

(a)


(b)


(c)


3. Figure 3 shows the cross section of a 45°-90°-45° glass prism of refractive index 1.49. A light ray is incident at *A* with an angle of incidence 15° and then strikes the side of the prism at *B*.

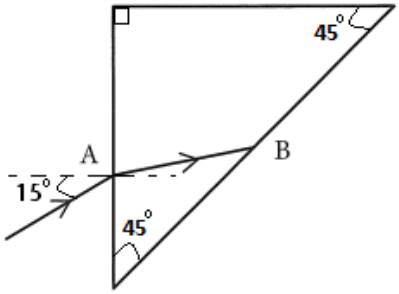


Figure 3

(a) Find the angle of refraction of the light ray at *A*. (2 marks)

(b) Find the angle of incidence of the light ray at *B*. (1 mark)

(c) Explain why the ray is totally reflected when it strikes the side of the prism at *B*. (2 marks)

4. Refer to Figure 4 in the answer sheet, an object *HK* is placed in front of a lens *Z*. A light ray *x* from *H* passes through the lens.

(a) Explain whether the lens is convex or concave. (2 marks)

(b) Construct the image of *HK* in Figure 4. (3 marks)

(c) Add a light ray to find the principal focus and mark it as *F* in Figure 4. (2 marks)

(d) Complete the light ray *y* in Figure 4. (1 mark)

5. Ronald designs a box which can project the screen of a phone onto a wall. He fixes his phone inside a box and cuts a hole on a surface of the box. A lens is then fixed at the hole and produces the image of the screen on a wall as shown in Figure 5a.

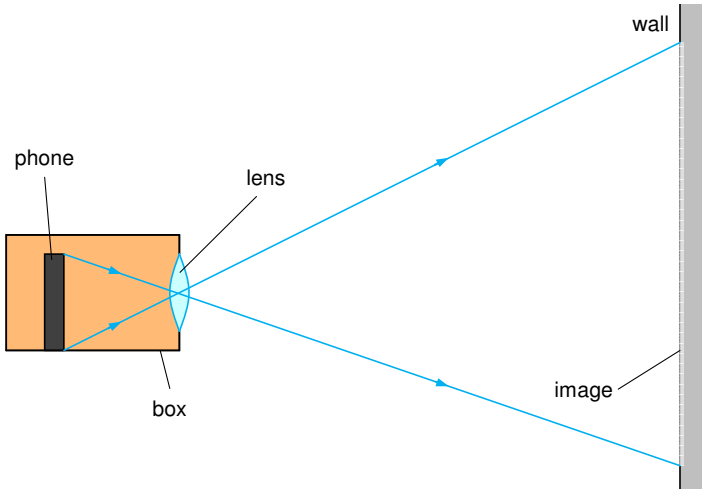


Figure 5a

(a) State the kind of lens used in the box. Explain briefly. (2 marks)

(b) When the screen of the phone is 20 cm away from the lens, a clear image is formed on a wall 80 cm away from the lens.

(i) Find the linear magnification of the image. (2 marks)

(ii) By drawing a suitable ray diagram on Figure 5b on the answer sheet, determine the focal length of the lens. (3 marks)

6. The following shows the electromagnetic spectrum with decreasing wavelength.

X	Microwaves	*Y*	Visible light	Ultra-violet	*Z*	Gamma Rays

(a) Name *X*, *Y* and *Z*. (3 marks)

(b) What is the speed of visible light in the air? (1 mark)

(c) Find the frequency of red light. Given that the wavelength of red light is 750×10^{-9} m. (1 mark)

7. A wave is generated on a string. Figure 7a below shows the shape of the string at a certain instant.

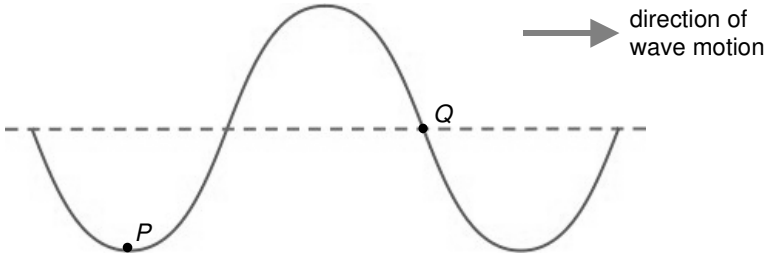


Figure 7a

(a) Describe the motion of particles *P* and *Q* at this instant. (2 marks)

(b) After a quarter of a period,

(i) draw the shape of string on Figure 7b on the answer sheet, and (2 marks)

(ii) mark the positions of *P* and *Q*. (1 mark)

8. As shown in Figure 8, the plane mirror *MN* of height *h* is mounted on a vertical wall. Find the minimum value of *h* so that the observer's eye at *E* can see the whole image of the poster *PQ* by the plane mirror. (2 marks)

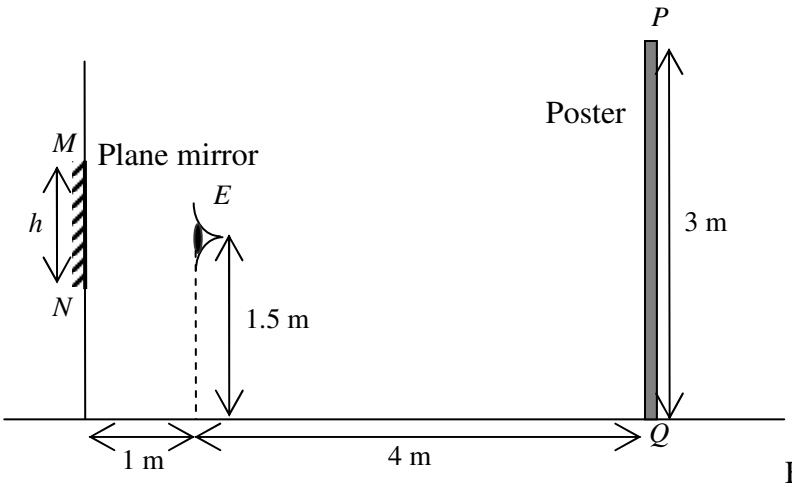


Figure 8

End of Section B

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