SAMPEL PERCUMA

Kertas Percubaan STPM Semester 3 Fizik

Set penuh: Kertas Percubaan STPM

Semester 3 · 10 subjek (2024)

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- Semester 1: kertas percubaan (trial) negeri, subjek yang dipilih + skema
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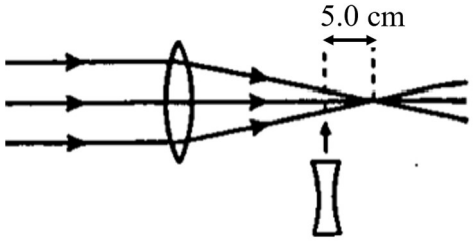
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5. The diagram below shows a convex lens focusing a beam of light which is incident on it. If a concave lens of a focal length of magnitude 10.0 cm is placed to intercept the converging light from the convex lens as shown, which of the following describes the final image formed?

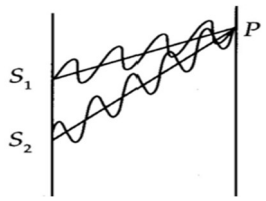


A. A real image between the two lenses.
B. A virtual image between the two lenses
C. A real image to the right of the concave lens
D. A virtual image to the right of the concave lens

6. A convex lens made of glass (refractive index = 1.5) has a focal length 24 cm in air. When it is totally immersed in water (refractive index = 1.33), its focal length changes to
A. 72 cm B. 94 cm C. 24 cm D. 15 cm

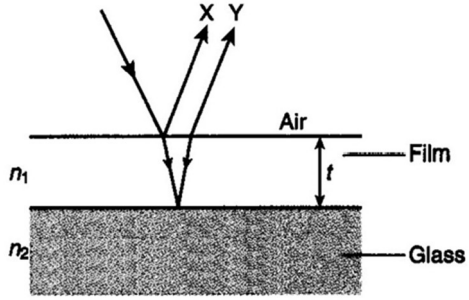
7. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be
A. 30 cm away from the mirror
B. 36 cm away from the mirror
C. 36 cm towards the mirror
D. 30 cm towards the mirror

8. A dark fringe occurs at *P* when coherent light is incident from two narrow slits S_1 and S_2.



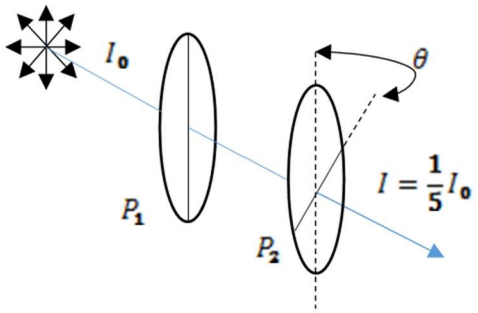
What is the phase relationship between the waves arriving at *P* from S_1 and S_2?
A. π, 2π, 3π, 4π B. 2π, 4π, 6π, 8π C. π, 3π, 5π, 7π D. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}$

9. The figure shows a ray incident on a glass surface coated with a film.



If the wavelength of light in the film is λ, and the refractive indices of the film and glass are n_1 and n_2 respectively, which of the following is the condition for destructive interference between the reflected rays X and Y ?
A. t = $\frac{\lambda}{4n}$ where $n_1 > n_2$ B. t = $\frac{\lambda}{2n}$ where $n_1 > n_2$ C. t = $\frac{\lambda}{2n}$ where $n_1 < n_2$ D. t = λn where $n_1 < n_2$

10. The figure below shows two pieces of polaroids, P_1 and P_2. The angle between the polarization axes of the two polaroids is θ.



If the intensity of the unpolarised light incident on polaroid P_1 is I_o and the intensity of the transmitted light from P_2 is $\frac{1}{5}I_o$, the angle θ is

A. 20.7^o B. 33.6^o C. 43.9^o D. 50.8^o

11. The graph shows the stopping potential versus frequency for two metals, A and B. If metal A has a lower threshold frequency than metal B, which statement is true?
A. The y-intercept for A is greater than for B.
B. The y-intercept for B is greater than for A.
C. The gradients of both graphs are different.
D. The stopping potential is dependent o light intensity.

12. If the potential difference applied to an X-ray tube is doubled while keeping the separation between the filaments and the target as same, what will happen to the cut-off wavelength?
A. will remain the same C. will be halved
B. will be doubled D. will be four times of the original wavelength

13. The de Broglie wavelength of an electron with kinetic energy E is λ. If its kinetic energy is increased by 4 times, its new de Broglie wavelength will be
A. $\frac{\lambda}{4}$ B. . $\frac{\lambda}{2}$ C. 2λ D. 4λ

14. The binding energy per nucleon maybe used as a measure of the stability of a nucleus. This quantity
A. is a maximum for nuclides in the middle of the Periodic Table.
B. is directly proportional to the neutron / proton ratio of the nuclide.
C. has maxima at values of atomic number corresponding to the noble (inert) gases.
D. falls to zero for heavy radioactive nuclides.

15. What is the function of control rods in a nuclear fission reactor ?
A. To slow down neutrons.
B. To absorb excess neutrons to control the rate of fission.
C. To cool the reactor core.
D. To reflect neutrons back into the core.

SECTION B. (15 marks)

Answer all questions.

16. The wave function for a traveling wave on a taut string is

$$y = 0.350 \sin(10\pi t - 3\pi x + \frac{\pi}{4})$$

a) Determine

i) frequency. [1 mark]

ii) wavelength. [1 mark]

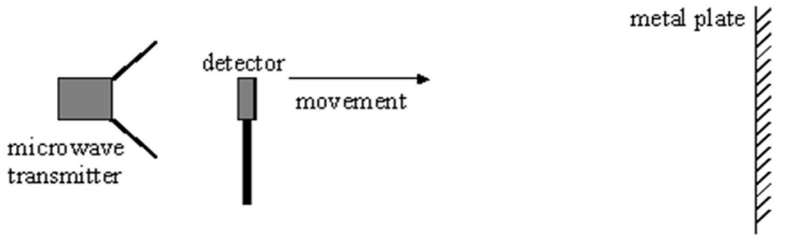
iii) speed. [1 mark]

iv) direction of the wave. [1 mark]

b) What is the vertical position of an element of the string at t = 0 and x = 0.100 m? [1 mark]

c) What is the maximum transverse speed of an element of the string? [2 marks]

17. A microwave transmitter directs waves towards a metal plate. When a microwave detector is moved along a line normal to the transmitter and the plate,it passes through a sequence of equally spaced maxima and minima of intensity.



a) Explain how these maxima and minima are formed. [5 marks]

b) The detector is placed at a position where the intensity is a minimum. When it is moved a distance of 144 mm it passes through nine maxima and reaches the ninth minimum from the starting point. Calculate

i) the wavelength of the microwaves. [1mark]

ii) the frequency of the microwave transmitter. [2 marks]

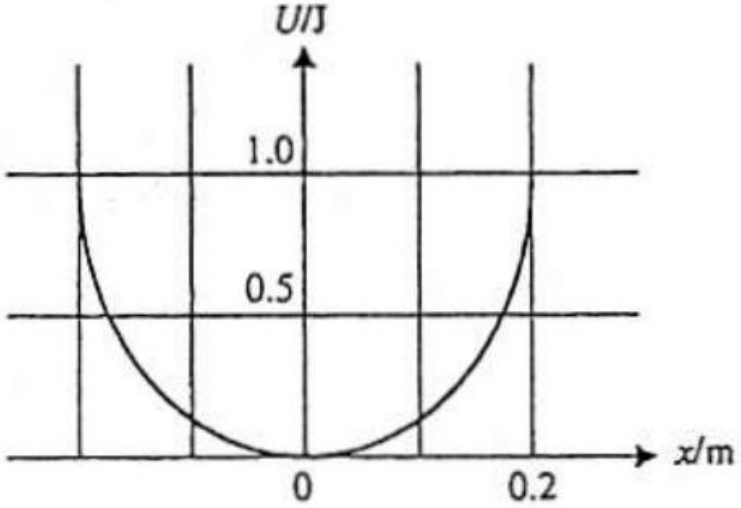
Section A [15 *marks*]
Answer **all** *questions*.

Indicate the correct answer on the Multiple-choice Answer Sheet provided.

1 A mass oscillationg in simple harmonic motion on the end of a spring has an amplitude A and a total energy E. The mass on the spring is doubled and made to oscillate with the same amplitude A. What is the total energy of the oscillating system after the change?

A E **B** $\sqrt{2}\,E$ **C** $2E$ **D** $4E$

2 A particle of mass 4.0 kg moves with simple harmonic motion and its potential energy U varies with position x as shown in the figure below.



What is the period of oscillation of the particle?

A $\frac{2\pi}{25}$ s **B** $\frac{\pi\sqrt{2}}{5}$ s **C** $\frac{8\pi}{25}$ s **D** $\frac{2\pi\sqrt{2}}{5}$ s

3 A progressive wave is represented by the equation $y = 0.40\cos(\pi t - 0.20\pi x)$ with x and y in metres, and t in seconds. Which of the following is correct?

	Frequency	*Wavelength*	*Velocity*
A	0.50 Hz	10 m	5.0 m s^{-1}
B	2.0 Hz	0.10 m	2.0 m s^{-1}
C	0.50 Hz	10 m	0.50 m s^{-1}
D	2.0 Hz	0.10 m	0.20 m s^{-1}

4 Which of the following statements is **true** concerning the vibration of a particle in a stationary wave?

A All particles between two consecutive nodes vibrate with the same phase.
B All particles between two consecutive antinodes vibrate with the same phase.
C All particles between two consecutive nodes have the same amplitude of vibration.
D All particles between two consecutive antinode have the same amplitude of vibration.

TAMAT SAMPEL

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