Revision Sheet 复习练习卷

A-Level Physics · Unit 7 Waves

14 vocabulary items · 21 marks of exam questions (9 questions)

Part 1 · Vocabulary review 词汇复习 (14 items). The terms this unit is examined on most. Mark it yourself from the answer key. 本单元最常考的词汇，请自行对照答案批改。

Section A · Chinese to English 中译英

Write the English word.

1. 波 _____ [1]
2. 横波 _____ [1]
3. 行波 _____ [1]
4. 振幅 _____ [1]
5. 波长 _____ [1]
6. 周期 _____ [1]
7. 频率 _____ [1]
8. 相位差 _____ [1]
9. 示波器 _____ [1]
10. 时基 _____ [1]
11. 强度 _____ [1]
12. 波源 _____ [1]
13. 电磁波 _____ [1]
14. 偏振片 _____ [1]

Part 2 · Exam questions 考试题 (21 marks, 9 questions) begins on the next page. They are ordered easy to difficult and none of them has been set before. 第二部分从下页开始，由易到难。

15 An aircraft produces a sound at a frequency of 30.0 Hz.

The speed of sound in air is 330 m s^{-1}.

The aircraft is directly in front of the stationary observer and travels in a straight line towards or away from the observer.

The observer hears the sound from the aircraft at a frequency of 20.0 Hz.

What is the speed and direction of the aircraft?

	speed / m s^{-1}	direction
A	110	away from observer
B	110	towards observer
C	165	away from observer
D	165	towards observer

16 Radio waves can be used to measure the distance between Earth and the planet Jupiter.

A pulse of radio waves is emitted from the surface of Earth. The pulse reflects from the surface of Jupiter and is detected again on Earth.

The time between emitting and receiving the pulse is 3960 s.

What is the distance between Earth and Jupiter?

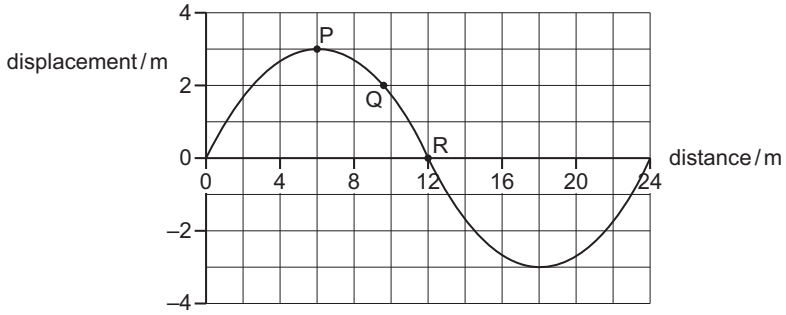
A 5.94×10^{8} km

B 1.19×10^{9} km

C 5.94×10^{11} km

D 1.19×10^{12} km

17 The graph shows the variation with distance along the wave of the displacement of water particles at a particular instant in time for a transverse water wave.



P, Q and R show the positions of three water particles in the wave.

Which particle has the greatest speed at the instant shown?

A all have the same speed

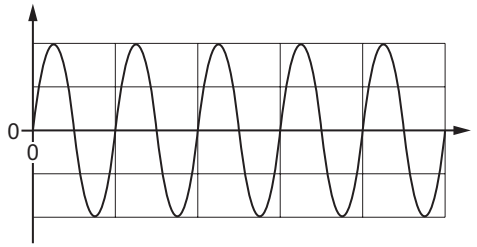
B particle P

C particle Q

D particle R

18 A progressive longitudinal wave is travelling horizontally from left to right.

A graphical representation of the wave at one instant in time is shown.



Which row could give the correct labels for the *x*-axis and *y*-axis of this graph?

	x-axis	*y*-axis
A	distance	displacement of particles to the right
B	distance	displacement of particles upwards
C	time	displacement of particles to the right
D	time	displacement of particles upwards

19 Which row could describe electromagnetic waves?

	type of wave	speed in free space
A	longitudinal	faster for shorter wavelengths
B	longitudinal	the same for all wavelengths
C	transverse	faster for shorter wavelengths
D	transverse	the same for all wavelengths

20 The diagram shows the shape at one instant in time of part of a stretched string as a wave travels along it from left to right.

What are the directions of the velocities of the points 1, 2 and 3 on the string at this instant in time?

	point 1	point 2	point 3
A	→	→	→
B	→	←	→
C	↑	↓	↑
D	↓	↑	↓

21 Which type of waves **cannot** be polarised?

A radio waves

B sound waves

C ultraviolet waves

D X-rays

22 A train travels at a constant high speed along a straight horizontal track towards an observer standing adjacent to the track, as shown in Fig. 5.1.

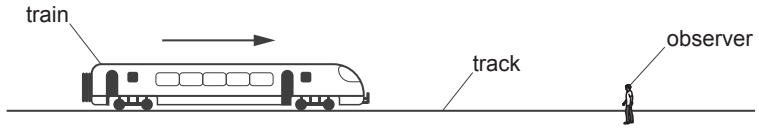


Fig. 5.1

The train sounds its horn continuously as it approaches the observer, from time $t = 0$ until it is well past the observer at time $t = t_2$. The train passes the observer at time $t = t_1$.
The horn emits a sound wave of constant frequency f_S.

(a) On Fig. 5.2, sketch the variation of the frequency of sound heard by the observer with time t, from time $t = 0$ to $t = t_2$.

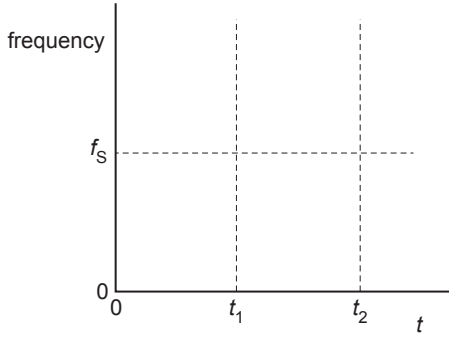


Fig. 5.2

[1]

(b) At a particular time, the sound waves at the observer have an intensity of $4.7 \times 10^{-3}\,\text{W m}^{-2}$. The waves at the observer are incident at right angles on a circular detector of radius 2.8 cm.

Calculate the power P of the waves incident on the detector.

$P =$ ..... W [3]

[Total: 4]

23 **(a)** **(i)** State the conditions required for the formation of a stationary wave.

.....

.....

.....

..... [2]

(ii) State the phase difference between any two vibrating particles in a stationary wave between two adjacent nodes.

phase difference = ...° [1]

(b) A motorcycle is travelling at 13.0 m s^{-1} along a straight road. The rider of the motorcycle sees a pedestrian standing in the road directly ahead and operates a horn to emit a warning sound. The pedestrian hears the warning sound from the horn at a frequency of 543 Hz. The speed of the sound in the air is 334 m s^{-1}.

(i) Calculate the frequency, to three significant figures, of the sound emitted by the horn.

frequency = ... Hz [2]

(ii) The motorcycle rider passes the stationary pedestrian and then moves directly away from her. As the rider moves away, he operates the horn for a second time. The pedestrian now hears sound that is increasing in frequency.

State the variation, if any, in the speed of the motorcycle when the rider operates the horn for the second time.

..... [1]

(c) A beam of vertically polarised monochromatic light is incident normally on a polarising filter, as shown in Fig. 5.1.

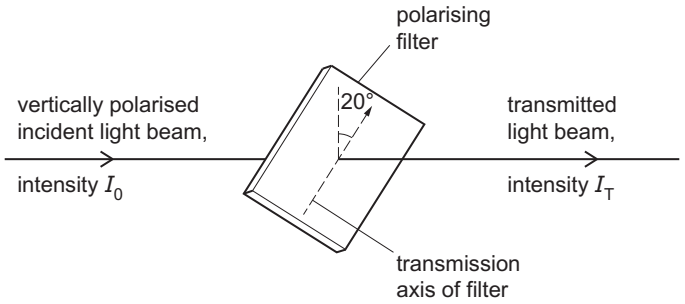


Fig. 5.1

The filter is positioned with its transmission axis at an angle of 20° to the vertical. The incident light has intensity I_0 and the transmitted light has intensity I_T.

(i) By considering the ratio $\frac{I_T}{I_0}$, calculate the ratio

$$\frac{\text{amplitude of transmitted light}}{\text{amplitude of incident light}}.$$

Show your working.

ratio = ... [3]

(ii) The filter is now rotated, about the direction of the light beam, from its starting position shown in Fig. 5.1. The direction of rotation is such that the angle of the transmission axis to the vertical initially increases.

Calculate the minimum angle through which the filter must be rotated so that the intensity of the transmitted light returns to the value that it had when the filter was at its starting position.

angle = ... ° [1]

[Total: 10]