

TSUNG TSIN SECONDARY SCHOOL
2006-07 FINAL EXAMINATION
PHYSICS II

S4

Date : .6.007

Full marks : 45 marks

Time allowed : 1 hour

Instructions :

There are 45 questions in this paper. Answer **ALL** questions.

Each question carries equal marks. Choose the best answer and marked on the Multiple Choice Answer Sheet. Two or more answers will score No Mark.

Take $g = 10 \text{ ms}^{-2}$

- 2 kg of liquid X is heated up by an immersion heater for 10 minutes. The temperature of X is raised from 20°C to 30°C . It is found that the power of the heater is 100 W and 1000 J of energy is lost to the surroundings. Calculate the specific heat capacity of X .
A $2950 \text{ J kg}^{-1} ^\circ\text{C}^{-1}$
B $3000 \text{ J kg}^{-1} ^\circ\text{C}^{-1}$
C $3050 \text{ J kg}^{-1} ^\circ\text{C}^{-1}$
D $5900 \text{ J kg}^{-1} ^\circ\text{C}^{-1}$
- Which of the following phenomena CANNOT be explained by conduction of heat?
A The furs and feathers of some wild animals are thickest in winter.
B The handles of saucepan are usually made of insulators of heat.
C The heating parts of the cooking utensils are made of metals.
D The heat exchanger at the back of refrigerator is painted black.
- Which of the following actions CANNOT increase the rate of heat loss by radiation of a hot object?
A Increase its temperature.
B Increase its surface area.
C Paint its surface silvery.
D Paint its surface dull black.
- A police car is patrolling on a straight highway at 100 km h^{-1} . When a speeding car travelling at 150 km h^{-1} passes the police car and is 10 m in front of it, it starts to accelerate and chases the speeding car. If the police car can accelerate at 3.5 m s^{-2} and the speeding car does not slow down, how long will it take for the police to catch up the speeding car?
A 3.97 s
B 8.6 s
C 14.2 s
D 28.8 s
- A stone falls freely from rest under gravity.

If its speed is x at the end of the 1st second, what is its speed at the end of the 2nd second?

- to be continued -

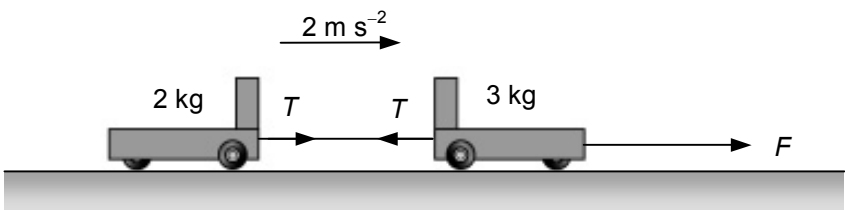
- A x
- B $2x$
- C $3x$
- D $4x$

6. Jeanie steps onto a weighing scale in a lift and the reading of the scale is 550 N.



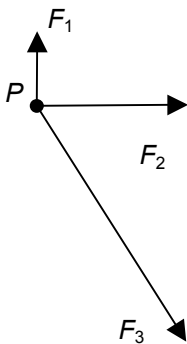
If her mass is 45 kg, which of the following statements about the lift is correct?

- A The lift is moving up with acceleration 2.22 m s^{-2} .
 - B The lift is moving down with acceleration 2.22 m s^{-2} .
 - C The lift is moving down with deceleration 1.8 m s^{-2} .
 - D The lift is moving up with deceleration 1.8 m s^{-2} .
7. In the following figure, two trolleys of mass 2 kg and 3 kg are tied together on a smooth plane and a horizontal force F pulls them.



If the trolleys have an acceleration of 2 m s^{-2} , what are the values of tension T and horizontal force F ?

- | | T | F |
|---|-----------------------|-----------------------|
| A | 2 N | 6 N |
| B | 4 N | 6 N |
| C | 6 N | 10 N |
| D | 4 N | 10 N |
8. Three forces F_1 , F_2 and F_3 act on a particle P as shown below. If a fourth force F_4 acts on P to keep it in equilibrium, find the magnitude of F_4 .



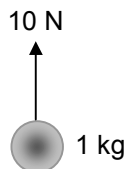
Scale: 1cm represents 1 N

- A 4.0 N
- B 4.2 N
- C 4.5 N
- D 5.8 N

9. A horizontal force F pushes a block of mass m along a horizontal rough plane at a constant speed v . What is the work done against friction during time t ?

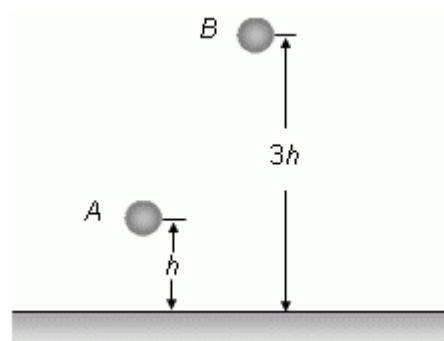
- A Fvt
 B $\frac{F}{m}vt$
 C $\frac{F}{m}vt$
 D mvt

10. A ball of 1 kg is raised by a force of 10 N over 5 m.



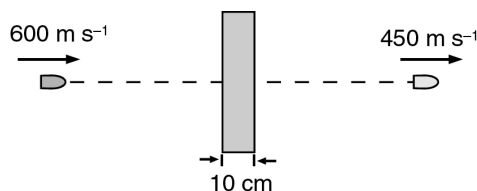
What is the kinetic energy gain of the ball?

- A 0 J
 B 10 J
 C 20 J
 D 50 J
11. A bullet of mass 40 g travels horizontally. It hits a wooden block at 330 m s^{-1} and comes out of the block at 208 m s^{-1} . If it takes the bullet 0.1 s to penetrate the block, what is the energy loss of the bullet?
- A 865 J
 B 1310 J
 C 2178 J
 D 13 100 J
12. In the following figure, ball A of mass $2m$ and ball B of mass $3m$ fall from the height of h and $3h$ respectively.



What is the ratio of the maximum velocity of A to that of B ?

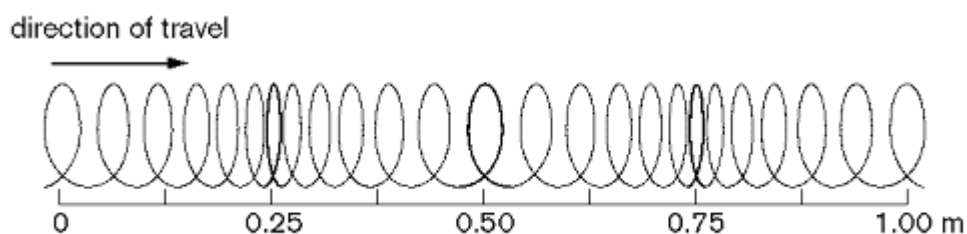
- A 1 : 3
 B 2 : 3
 C $1 : \sqrt{3}$
 D $2 : \sqrt{3}$
13. In the following figure, a 0.01-kg bullet travelling at a speed of 600 m s^{-1} penetrates a 10-cm wooden block.



If the bullet emerges from the block at 450 m s^{-1} , what is the average resistance of the wooden block? Assume the air resistance is negligible.

- A 6542 N
- B 7875 N
- C 8735 N
- D 9560 N

14. A travelling longitudinal wave is generated along a slinky spring at a frequency of 5 Hz . The figure below shows the wave at a certain time instant.



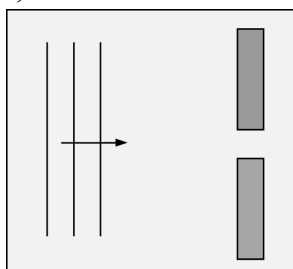
What is the speed of the wave?

- A 1.25 m s^{-1}
- B 2.5 m s^{-1}
- C 5 m s^{-1}
- D 10 m s^{-1}

15. Which of the following statements about a transverse wave is/are correct?

- (1) It consists of troughs and crests.
 - (2) All particles within one wavelength have the same frequency.
 - (3) All particles within one wavelength vibrate in phase.
- A (1) only
 - B (2) only
 - C (1) and (2) only
 - D (2) and (3) only

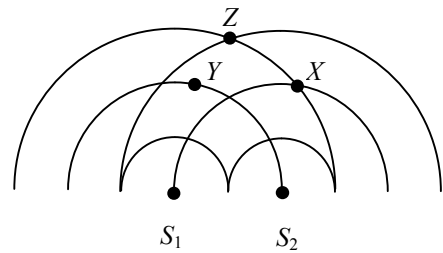
16. In a ripple tank experiment, a water wave is diffracted as they pass around a small gap.



Which of the following changes would produce the most significant diffraction effect?

- A Double the width of the gap.
- B Increase the frequency of the vibrator.
- C Add more water into the ripple tank.
- D Place the vibrator closer to the gap.

17. Dippers, S_1 and S_2 , which are under the same vibrator, produce circular wavefronts in a ripple tank. Which of the following is/are correct?



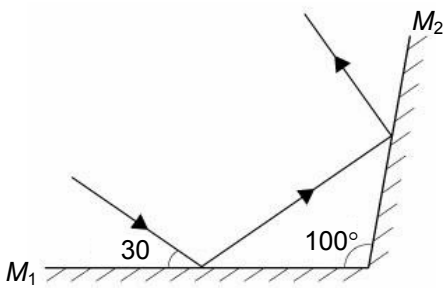
- (1) Constructive interference occurs at X , Y and Z .
 - (2) Amplitude of Y is always zero.
 - (3) More nodal and antinodal lines can be observed when the frequency of the dippers increases.
- A (1) only
B (3) only
C (2) and (3) only
D (1), (2) and (3)
18. In the Young's double-slit experiment, a series of light waves travels towards a pair of slits. Which of the following quantities would remain unchanged after the waves pass through the slits?
- (1) Wavelength
 - (2) Frequency
 - (3) Speed
- A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)
19. Arrange the following electromagnetic waves in ascending order of frequency.
- | | | | |
|-----|---------------|----|--------------|
| I | Infra-red | II | Ultra-violet |
| III | Visible light | IV | Radio waves |
- A Infra-red < Visible light < Ultra-violet < Radio waves
B Ultra-violet < Infra-red < Visible light < Radio waves
C Radio waves < Infra-red < Visible light < Ultra-violet
D Infra-red < Visible light < Radio waves < Ultra-violet
20. The following figure shows part of the electromagnetic spectrum.

Microwaves	A	Visible light	B	X-rays
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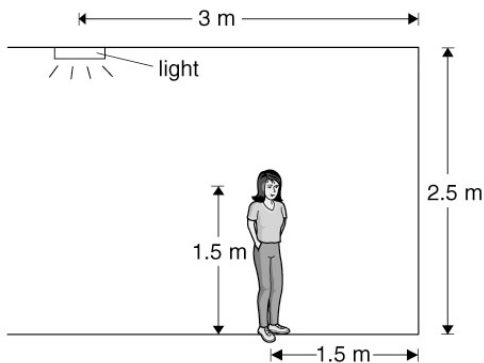
Which of the following statements is/are INCORRECT?

- (1) The wavelength of A is longer than that of B .
 - (2) B is infra-red radiation.
 - (3) A is blue light.
- A (1) only
B (2) only
C (1) and (2) only
D (2) and (3) only

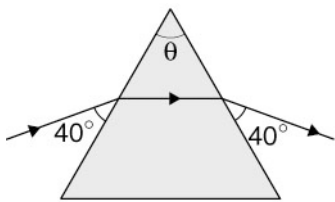
21. In the figure below, what is the angle of reflection on mirror M_2 ?



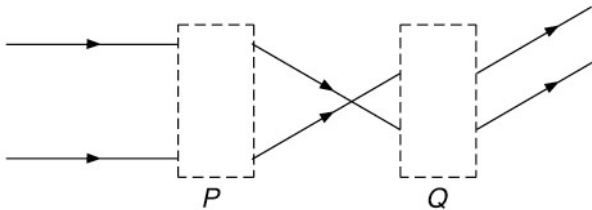
- A 40°
B 45°
C 50°
D 55°
22. A girl with her eyes 1.5 m above the ground stands in front of a wall, as shown in the following figure. If a small mirror is to be hung on the wall, which position should it be placed so that the girl can see the lamp behind her?



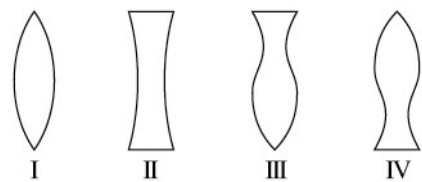
- A 1.50 m above the ground
B 1.63 m above the ground
C 1.75 m above the ground
D 1.83 m above the ground
23. A light ray passes through a triangular prism as shown in the following figure. What is angle θ ? (take refractive index of glass = 1.5)



- A 51°
B 53°
C 61°
D 65°
24. The following diagram shows two parallel light rays passing through two lenses.

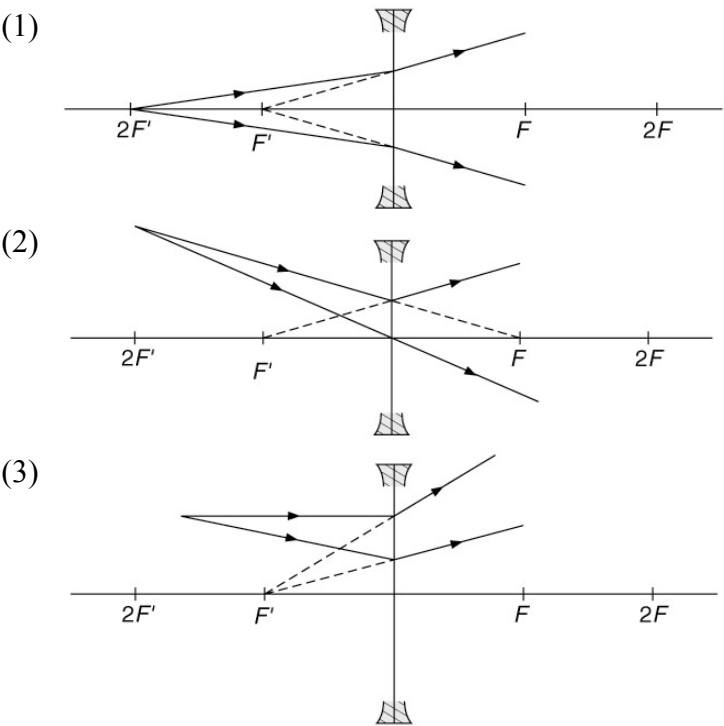


Which of the following lenses are placed in regions P and Q respectively?



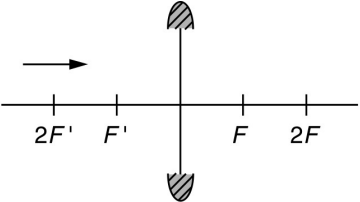
	<i>P</i>	<i>Q</i>
A	I	IV
B	I	III
C	II	IV
D	III	II

25. If F and F' are the foci of a concave lens, which of the following ray diagrams is/are INCORRECT?

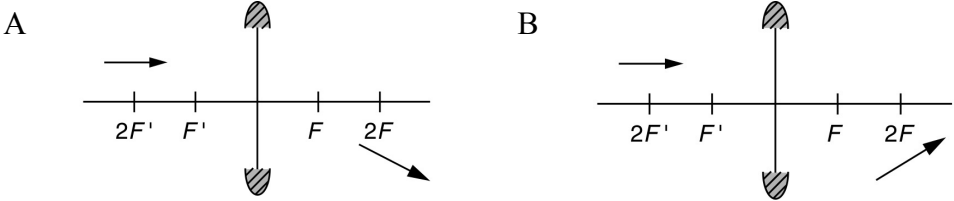


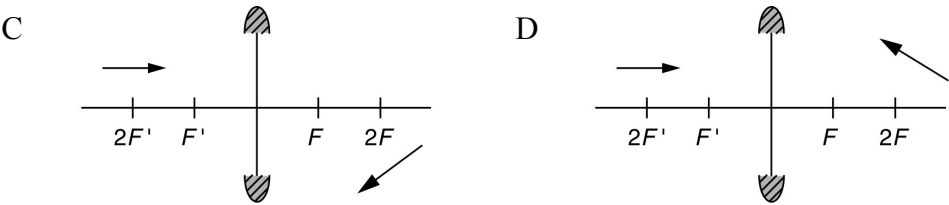
- A (2) only
- B (1) and (3) only
- C (2) and (3) only
- D (1), (2) and (3)

26. In the following diagram, F and F' are the foci of the lens and an arrow locates around $2F'$.

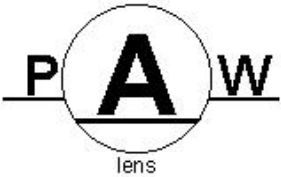


Which of the following diagrams shows the image correctly?



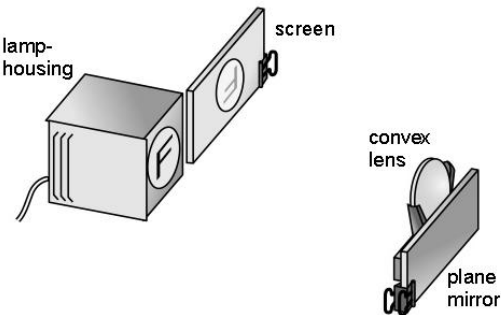


27. Some letters are viewed by a lens. The image of the letters is shown in the following figure.



If the lens is moved away from the letters, which of the following correctly describes how the appearance of the image changes?

- A magnified, erect $\rightarrow$ magnified, inverted $\rightarrow$ diminished, inverted
 - B magnified, erect $\rightarrow$ magnified, inverted $\rightarrow$ more magnified, inverted
 - C magnified, erect $\rightarrow$ diminished, inverted $\rightarrow$ more diminished, inverted
 - D magnified, erect $\rightarrow$ magnified, inverted $\rightarrow$ more magnified, erect
28. Which of the following optical devices can form a virtual and magnified image?
- (1) Convex lens
 - (2) Concave lens
 - (3) Plane mirror
- A (1) only
 - B (2) only
 - C (1) and (3) only
 - D (2) and (3) only
29. Which of the following statements about the following experiment is/are correct?



- (1) The focal length of the convex lens is equal to the distance between the convex lens and the lamp-housing.
 - (2) The brightness and shape of the image will not change if the plane mirror is moved a little bit backwards.
 - (3) The shape of the image will not change if the upper half of the lens is covered by a card.
- A (1) only
 - B (1) and (3) only
 - C (2) and (3) only
 - D (1), (2) and (3)
30. John is in front of a plane mirror. If the mirror moves away from him at a speed of 2 m s^{-1} , at what speed does his image move away from him?

- A 1 m s^{-1}
- B 2 m s^{-1}
- C 4 m s^{-1}
- D 8 m s^{-1}

31. Which of the following about the image formed by a plane mirror is INCORRECT?

- A Virtual.
- B As far behind the mirror as the object is in front.
- C The right way up but laterally inverted.
- D Magnified.

32. A man sees an object F through a prismatic periscope.

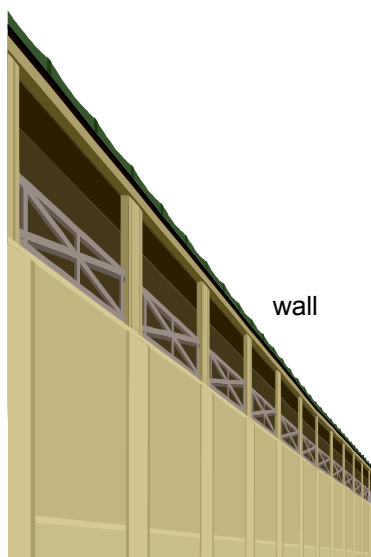
What is the image that he sees?

- A 
- B 
- C 
- D 

33. A series of sound waves travels towards a house. When the waves pass the house, they bend around the corners of the house. Which of the following is/are correct?

- (1) The phenomenon is called diffraction.
 - (2) The speed of the waves remains unchanged as they bend around the corners.
 - (3) The degree of bending of the waves depends on the size of the house relative to the wavelength of the waves.
- A (1) and (2) only
 - B (1) and (3) only
 - C (2) and (3) only
 - D (1), (2) and (3)

34. A man stands facing a wall. He claps his hands and hears the echo after 2.5 s.



a man claps
his hand



(The diagram is not drawn to scale.)

If the speed of sound is 340 m s^{-1} , what is the separation between the man and the wall?

- A 425 m
- B 625 m
- C 850 m
- D 1250 m

35. Which of the following statements about heat, internal energy and temperature of two objects is/are correct?
- (1) The object with larger internal energy must have a higher temperature.
 - (2) The object with particles of larger average kinetic energy must have a higher temperature.
 - (3) When objects are in contact, heat is transferred from the one with larger internal energy to the other.
- A (1) only.
B (2) only.
C (1) and (3) only.
D (2) and (3) only.
36. Which of the following descriptions about evaporation of water is/are correct?
- (1) The average kinetic energy of water decreases during evaporation.
 - (2) Evaporation takes place only when the water temperature is greater than the room temperature.
 - (3) Water absorbs energy when it boils as well as it evaporates.
- A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)
37. Which of the following statements about greenhouse effect of the Earth is/are correct?
- (1) Thinning of the ozone layer in the atmosphere enhances the greenhouse effect, resulting in global warming.
 - (2) Water vapor, carbon dioxide and certain gases in the atmosphere absorb the infra-red radiation emitted by the Earth surface.
 - (3) At equilibrium, the incoming and outgoing radiation are balanced, the Earth's average temperature remains relatively constant.
- A (1) and (2) only.
B (1) and (3) only.
C (2) and (3) only.
D (1), (2) and (3).
38. When two objects of different temperatures are put in contact, which of the following statements is/are correct?
- (1) After sufficiently long time, their final temperatures will be the same.
 - (2) The temperature rise of one object is equal to the temperature drop of another object.
 - (3) The specific heat capacity c of the whole body is equal to $\frac{c_1 + c_2}{2}$, where c_1 and c_2 are the specific heat capacities of the two objects.
- A (1) only.
B (1) and (2) only.
C (1) and (3) only.
D (2) and (3) only.

Directions: Each question below consists of two statements. Decide whether each of the two statements is true or false. If both are true, then decide whether or not the second statement is a correct explanation of the first statement. Then select option A, B, C, or D according to the following table:

	1st statement	2nd statement	
A	True	True	The 2nd statement is a correct explanation of the 1st statement
B	True	True	The 2nd statement is not a correct explanation of the 1st statement.
C	True	False	
D	False	True	

	1st statement	2nd statement
39.	The temperature of a substance does not change when it changes from solid state to liquid state.	The average kinetic energy of particles of the substance does not change when it changes state.
40.	The acceleration of a ball flying up is zero when it reaches the highest point.	The ball is momentarily at rest
41.	A car that runs along a curve at constant speed does not have a constant velocity.	A constant velocity means a constant speed with no change in direction of travel.
42.	When two balls collide, total kinetic energy of the balls must be conserved.	Conservation of energy is always valid.
43.	A car collides head-on with a wall and stops. The force acting on the driver becomes smaller if he wears seat-belt.	The force of impact decreases when the time of impact increases.
44.	In an inelastic collision, both kinetic energy and momentum are conserved.	In a collision, the total momentum of the colliding objects before collision is equal to the total momentum after collision, provided that there is no external force acting on the objects.
45.	When different musical instruments play the same note, they sound different.	The sounds of a note given by different musical instruments have the same pitch but different quality.