Q1) Two bodies having an equal mass move with uniform velocities v and $3v$. Find the ratio of their kinetic energy.

Solution:

It is given that the masses of the two bodies are equal. Let the mass of each body be m.

Mass of the first body = m

Velocity of the first body = v

$$\therefore \text{K.E. of the first body} = \frac{1}{2}mv^2 \quad ...(i)$$

Mass of the second body = m

Velocity of the second body = $3v$

$$\therefore \text{K.E. of the second body} = \frac{1}{2}m(3v)^2$$
$$= \frac{1}{2} \times m \times 9v^2$$
$$= \frac{9}{2}mv^2 \quad ...(ii)$$

To find the ratio of the kinetic energy of the two bodies, we should divide equation (i) by equation (ii).

Thus, we get

$$\frac{\text{K.E. of the first body}}{\text{K.E. of the second body}} = \frac{\frac{1}{2}mv^2}{\frac{9}{2}mv^2}$$

$$\text{Or,} \quad \frac{\text{K.E. of the first body}}{\text{K.E. of the second body}} = \frac{1}{9}$$

Therefore, the ratio of the kinetic energy of the two bodies is 1 : 9.

Q2) (i) *Complete the table.*

-	Disease	-	Characteristic feature
(a)	Malaria	(a)	Causative agent: _____
(b)	_____	(b)	Immune system gets damaged

(c)	_____	(c)	Viral disease which causes inflammation of the liver
(d)	Ringworm	(d)	Caused by _____
(e)	Pneumonia	(e)	_____-borne disease
(f)	_____	(f)	Treated by quinine

(ii) *Differentiate between*:

(a) Healthy and diseased states

(b) Infectious and non-infectious causes of diseases

Solution:

(i)

-	Disease	-	Characteristic feature
(a)	Malaria	(a)	Causative agent: *Plasmodium*
(b)	AIDS	(b)	Immune system gets damaged
(c)	Hepatitis / jaundice	(c)	Viral disease which causes inflammation of the liver
(d)	Ringworm	(d)	Caused by fungi
(e)	Pneumonia	(e)	Air-borne disease
(f)	Malaria	(f)	Treated by quinine

(ii)

(a)

Healthy state	Diseased state
It is the state of physical, mental and social well being.	It is the state of overall discomfort (*dis* + ease).
It depends upon the environment and society.	It solely depends upon the diseased person.

(b)

Infectious causes of diseases	Non-infectious causes of diseases
When the causes of diseases are microbes, the diseases are said to be infectious.	When the causes of diseases are not microbes, but other factors (like obesity), the diseases are said to be non-infectious
It includes external causes.	It includes internal causes.
Typhoid, dysentery AIDS, etc., are caused by infectious agents.	Diabetes and some forms of cancers are caused by non-infectious agents.

Q3) (a). Using pressure-time graphs, differentiate between the following:

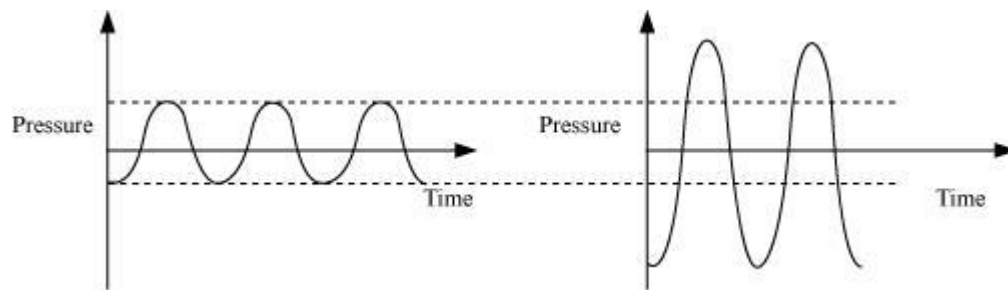i. Sharp and flat sounds

ii. Soft and loud sounds

(b). A sound wave has a frequency of 5 kHz and wavelength of 20 cm. How long will it take to travel 2 km? Will it be audible to a man standing there?

Solution:

(a). (i) Flat:-
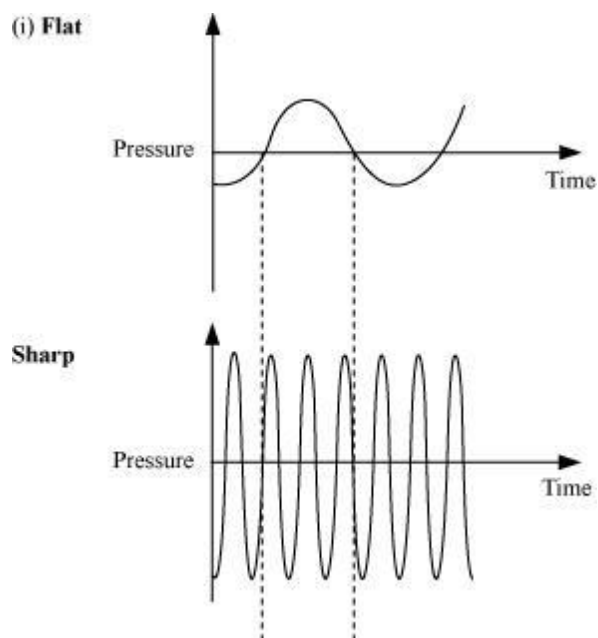
(ii) Soft:-

(b). Given that:

Frequency, v = 5 kHz = 5,000 Hz

Wavelength, λ = 20 cm = 0.20 m

Speed (*v*) of a sound wave is related to its wavelength and frequency as:

speed, *v* = vλ

= 5,000 × 0.20

= 1,000.0 m/s

Also,
$$v = \frac{\text{Distance}}{\text{Time}}$$

Given that distance = 2 km = 2,000 m

We haveTherefore, time
$$= \frac{2,000}{v}$$

$$= \frac{2,000}{1,000}$$

= 2 s

The sound will take 2 s to travel 2 km.

A man standing there will be able to hear the sound since its frequency (5,000 Hz) is within the range of audible frequencies (20−20,000 Hz) for humans.

Q4) *Answer the following questions.*

(i) Write a short note on modes of transmission of communicable diseases.

(ii) Write a short note on infectious agents.

(i) Communicable diseases spread through the following ways.

(a) **Through air** − The microorganisms that cause diseases such as influenza, chicken pox, etc., are transmitted through air as and when the infected person sneezes or coughs.

(b) **Through water** − The microorganisms that cause diseases such cholera, typhoid, etc., spread through contaminated water containing the faeces of infected individuals.

(c) **Blood to blood contact** − This occurs during blood transfusion, pregnancy, etc. AIDS is transmitted in this way.

(d) **Animal vectors** − Insects carry disease-causing microbes in their saliva and transmit them to the healthy individuals by biting them. Malaria and dengue is spread in this way

(e) **Direct physical contact** − AIDS and syphilis are sexually-transmitted diseases.

(ii) Infectious agents are organisms that cause diseases, e.g., bacteria, fungi, protozoa, viruses and some multicellular organisms.

(a) *Bacteria* − These are unicellular organisms that cause diseases such as typhoid, cholera, etc.

(b) *Fungi* − These are multicellular eukaryotes which are heterotrophic and lack chlorophyll. They cause athlete's foot, ringworm, etc.

(c) *Protozoa* − These include simple eukaryotic unicellular organisms that cause diseases such as amoebiasis, malaria, kala-azar, etc.

(d) *Viruses* − These are tiny organisms that cannot grow, multiply or reproduce on their own. They are essentially parasites as they need the host's machinery for multiplying. They cause diseases such as AIDS, jaundice, swine flu, etc.

(e) *Multicellular organisms* − These are parasitic worms. Pinworms, hookworms, tapeworms, etc., come under this category. They cause diseases such as liver rot, anaemia, etc.

Q5) In an experiment to find out the speed of a pulse propagated through a stretched spring, the spring used should be

   A) long, hard and rigid

   B) short, hard and rigid

   C) long, soft and flexible

   D) short, soft and flexible

Answer:

C

Solution:

In the experiment conducted to find out the speed of a pulse propagated through a stretched string, the string should be long, soft and flexible.

Hence, the correct option is C.

Q6) A student carried out a reaction between calcium and zinc carbonate. When 5.6 g of calcium was reacted with 12.4 g of zinc carbonate, 10.3 g of calcium carbonate and x g of zinc were obtained. What is the value of x?
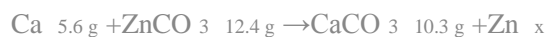
    A) 2.4

    B) 5.6

    C) 7.7

    D) 8.1

Answer:

C

Solution:

Given below is a balanced chemical reaction between calcium and zinc carbonate:

$$Ca_{\ 5.6\ g} + ZnCO_{3\ \ 12.4\ g} \rightarrow CaCO_{3\ \ 10.3\ g} + Zn_{\ x}$$

According to the law of conservation of mass, the mass of the reactants is equal to the mass of the products.

$\therefore$ 5.6 + 12.4 = 8.3 + x
x = 18 − 10.3
x = 7.7

Hence, the correct option is C.

Q7) In the laboratory, a student decomposed 90 g of calcium carbonate. Which of the following statements is correct regarding the mass of the products formed after decomposition?

    A) The difference in the masses of products is equal to the mass of $CaCO_3$.

    B) The sum of the masses of products is equal to the mass of $CaCO_3$.

    C) The mass of product is greater than the mass of $CaCO_3$.

    D) The mass of product is lesser than the mass of $CaCO_3$.

Answer:

D

Solution:

Given below is a balanced chemical reaction showing the decomposition of calcium carbonate:

$CaCO_3 (s) \, _{90 \, g} - \rightarrow - - - - - \quad \Delta \quad CaO(s) + CO_2 (g)$

According to the law of conservation of mass, the mass of reactants is equal to the mass of the products. However, carbon dioxide gas escapes in the surroundings. Thus, the mass of the product will be less than that of $CaCO_3$.

Hence, the correct answer is D.

Q8) In an experiment, 115 g of copper was allowed to react with 48 g of oxygen gas to form copper (II) oxide. After the reaction, no residue was left. What amount of copper (II) oxide was formed after the experiment?

 A) 48 g

 B) 67 g

 C) 115 g

 D) 163 g

Answer:

D

Solution:

Reaction between copper and oxygen:

$2Cu + O_2 \rightarrow 2CuO$
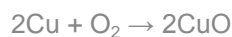
According to the law of conservation of mass, the mass of reactants is equal to the mass of products.

∴ Mass of copper + Mass of oxygen = Mass of copper (II) oxide

(115 + 48) g = Mass of copper (II) oxide

Thus, 163 g of copper (II) oxide was formed during the reaction.

Hence, the correct option is D.

Q9) Which stage of the mosquito lifecycle is also known as the wriggler?

 A) Egg

 B) Pupa

 C) Adult

 D) Larva

Solution:

Mosquito larva is also known as wriggler.
Hence, the correct option is D.

Q10) Which of the following relations between the angle of incidence of sound and the angle of reflection of sound is correct for a sound wave reflecting on a hard surface?

A) Angle of incidence/ Angle of reflection >1

B) Angle of incidence /Angle of reflection <1

C) Angle of incidence /Angle of reflection $=1$
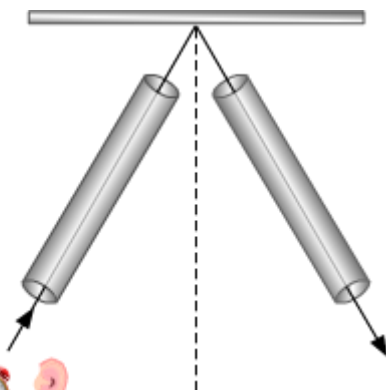
D) Angle of incidence/ Angle of reflection $=0$

View Solution

Solution:

According to the law of reflection of sound, the angle of incidence of sound wave is equal to the angle of reflection.

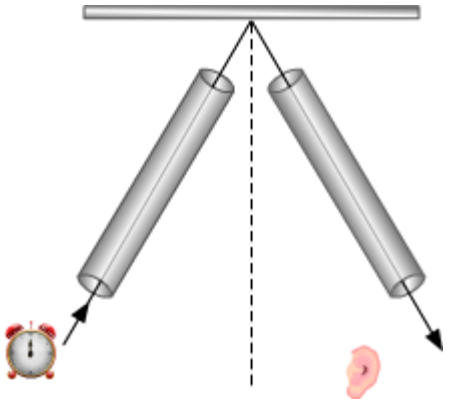$\therefore$ Angle of incidence/ Angle of reflection $=1$
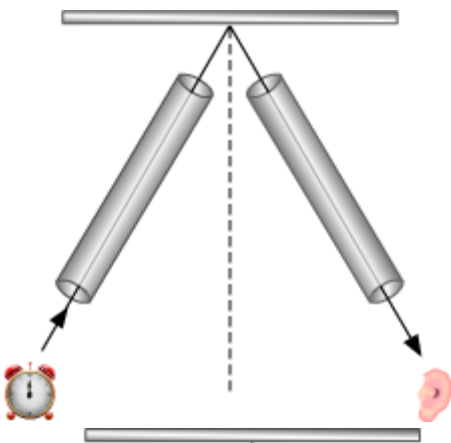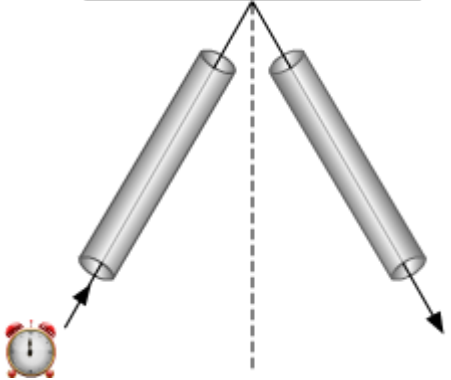
Hence, the correct option is C.

Q11) Which of the following setups is correct for the experiment to verify the laws of reflection of sound?

- A)

B)



C)

D)

View Solution

Answer:

B

Solution:

Setup B is correct since the position of the ear in this setup is correct.

Hence, the correct option is B.

Q12) A student is asked to perform an experiment to verify the law of reflection of sound. For this, he measured the angle of reflection for different values of angle of incidence and plotted them graphically. Which of following graphs represents the correct relationship between the angle of incidence and the angle of reflection?

- A)

- B)

- C)

- D)
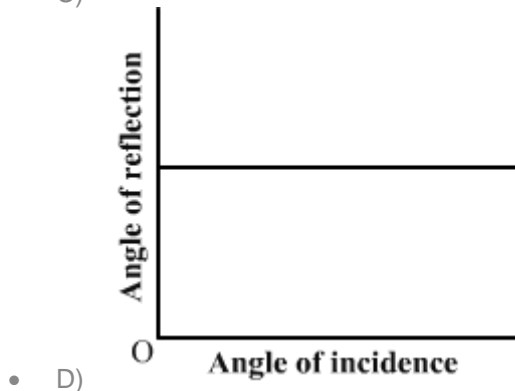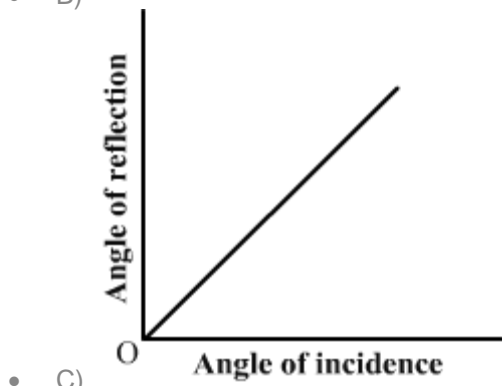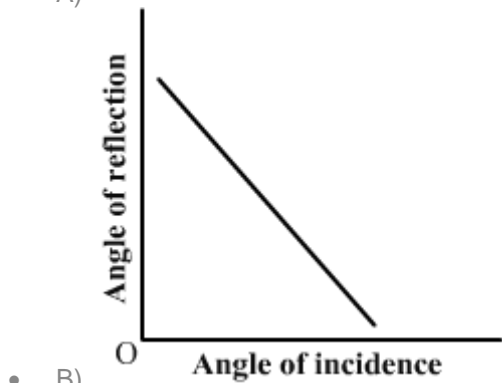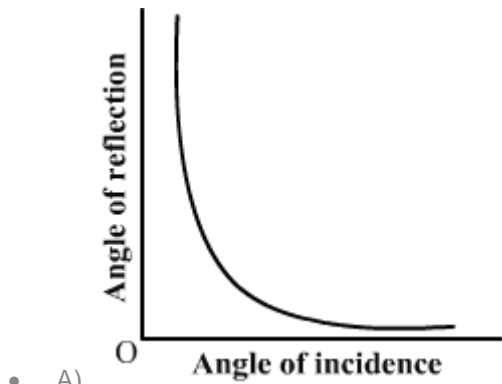
Answer:

C

Solution:

According to the law of reflection of sound,
Angle of incidence = Angle of reflection

So, graph between the angle of incidence and the angle of reflection of sound wave must be a starlight line passing through the origin.

Hence, the correct option is C.

Q13) Water level of a measuring cylinder before and after immersing a solid in it is shown in the figure given below.
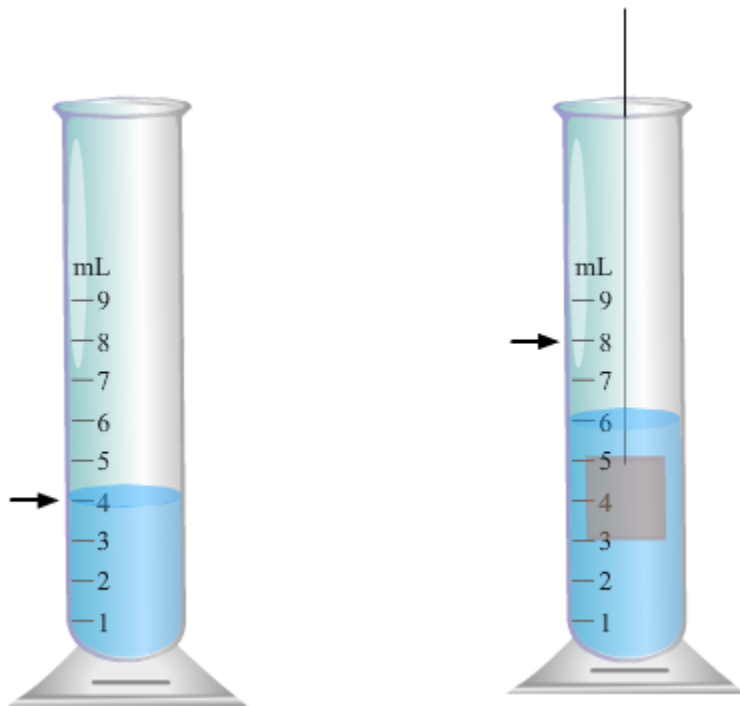
Volume of the rectangular block immersed in the liquid is

A) 1 mL

B) 2 mL

C) 3 mL

D) 4 mL

Answer:

B

Volume of the block = Final reading − Initial reading
= 6 mL − 4 mL
= 2 mL

Hence, the correct option is B.
Q34)

Density of water is maximum at

   A) 0°C

   B) 4°C

   C) 100°C

   D) 1000°C

Answer:

B

Solution:

Density of water is maximum at 4°C.

Hence, the correct option is B.
Q16) What is the effect on the density of a solid body if its volume is reduced to half without affecting its mass?

   A) Becomes half

   B) Remains same

   C) Becomes twice

   D) Becomes thrice

Answer:

C

Solution:

Density of a body is given as
Density = Mass/ Volume

If the volume is reduced to half, without affecting its volume, then the density of the solid will become twice the initial density.

Hence, the correct is option C.

Q17) A stone is suspended from a spring balance and its weight is recorded. The stone is then immersed completely in brine solution, water, alcohol and petrol one by one.
The loss in the weight of the stone is maximum in

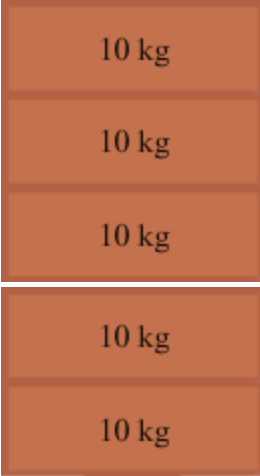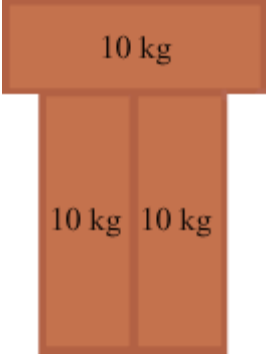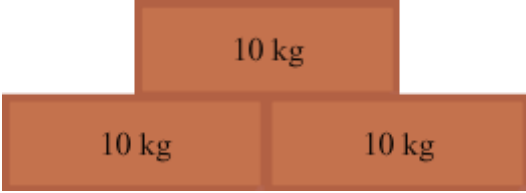A) brine

B) water

C) petrol

D) alcohol

Answer:

D

Solution:

If the body is fully immersed in a liquid, the apparent loss the weight of the body is equal to the weight of the liquid displaced. And weight of the liquid displaced by the body is directly proportional to the density of the liquid. As the density of brine solution is highest among the given liquids, the loss in the weight of the stone is maximum in brine solution.

Hence, the correct option is A.

Q18) Which of the following arrangements of cuboids exerts the greatest pressure at the base?

- A)

- B)

10 kg

10 kg 10 kg

- C)

10 kg

10 kg   10 kg

- D)

View Solution

Answer:

B

Solution:

Since the pressure exerted by a body at the base is inversely proportional to the area of the body in contact with the surface, the arrangement of cuboids having less surface area in contact with the surface below will exert the greatest pressure.

Hence, the correct option is B.

Q19) In an experiment conducted to determine the velocity of a pulse propagated through a long stretched spring, the jerk given to create a pulse is

A) along the length of the string

B) at an angle of 60° with the string

C) at an angle of 45° with the string

D) perpendicular to the length of the string

Answer:

D

Solution:

In the experiment conducted to determine the velocity of a pulse propagated through a long stretched spring, the jerk should be perpendicular to the length of the spring to produce the pulse.

Hence, the correct option is D.

Q20) Birds are adapted to aerial mode of life. Which of the following features does **not** justify the given statement?

A) Heavy bones

B) Streamlined body

C) Feathers

D) Air sacs

Answer:

A

Solution:

Birds are adapted to aerial mode of living because of following features:

- Presence of pneumatic (hollow) bones
- Streamlined body for flying
- Feathers that provide insulation
- Well-developed flight muscles
- Attachment of air sacs to the lungs for double respiration

Hence, the correct option is A.

Q21) A student observed cycloid scales on the specimen of a fish. Which of the following fish specimens he might have observed?

A) *Scoliodon*

B) *Torpedo*

C) *Trygon*

D) *Labeo*

Answer:

D

Solution:

Presence of cycloid scales is a feature of bony fish, to which *Labeo* belongs.

Hence, the correct option is D.

Q22)
Use the following information to answer the next question.

Birds belong to class ___*i*____. In these organisms, wings are the modified forms

of _____*ii*_____ .

The information in which of the following alternatives correctly completes the above statements?

    A) i- Reptilia, ii-forelimbs

    B) i- Pisces, ii- hindlimbs

    C) i- Aves, ii- hindlimbs

    D) i- Aves, ii- forelimbs

Answer:

D

Solution:

Birds belong to class Aves. In these organisms, wings are the modified forms of forelimbs. Hence, the correct option is D.