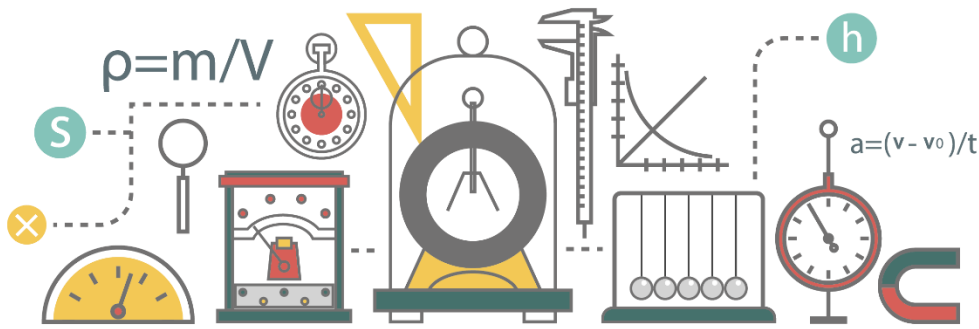# Guide to participation in the Physics Talent Track Competition

مؤسسة الملك عبدالعزيز ورجاله للموهبة والإبداع
King Abdulaziz & his Companions Foundation for Giftedness & Creativity

دليل المشاركة في مسابقة موهوب
تخصص الفيزياء

Prepared by: Saudi Physics Team

بسم الله الرحمن الرحيم

Content

"موهبة ... حيث تنتمي"

Introduction

In line with the Kingdom's determination to achieve vision 2030 objectives that are primarily concerned with transforming into an innovative knowledgeable society and the strategic plans directed to achieve the goals of sustainable national development and given that scientific competitions that are no longer an indispensable luxury, but rather have become an objective equation for excellence and progress in scientific fields. For the reason that it is with the momentum the competition to ascend the podiums, everyone who wants to achieve this must take all the means that allow them not only to access those platforms but to reserve a permanent place on them.

There is no doubt that many countries rely on local competitions as one of the methods for developing and raising the rates of scientific creativity and innovative capabilities and discovering the scientific talents of their students to provide them with the necessary scientific care. That fact has been perceived by the world around us for a long time.

Hungary, for instance, held the first mathematics competition in 1894, i.e. 119 years ago. Whereas more than 79 local competitions are organized at all levels and regions in the United States. Perhaps everyone agrees here that the mobility that these competitions do on all the elements of the educational process goes beyond solely winning a competition, but rather deepens on the positive impact, which aims at raising the professional competencies of teachers and achieving the ambition of our distinguished sons and daughters to obtain ideas that are much deeper than the ones provided by a school curriculum.

The methods of implementing these competitions vary according to the different goals and aspirations of the organizing countries. It is perhaps agreed upon by everyone here that the movement that these competitions make on all elements of the educational process goes beyond just winning a competition, but deepens the positive impact, which is aimed at raising the professional competencies of teachers and achieving the ambition of our distinguished sons and daughters. To get deeper ideas than what the school curriculum offers.

King Abdul Aziz and His Companions Foundation for Giftedness and Creativity "Mawhiba" have always been the forerunner to such challenges. From which it always aims to discover the nation's talents in scientific disciplines, and keen to find different sources to improve the quality of selection.

Along with the National Program for Gifted Students Identification, "Mawhoob" Mathematics Competition And science competition was established to delves deeply in search of these creative national competencies and capabilities to find them early. Allowing us to refine, nurture, and train them for a sufficient period to achieve the standards of participation in the International Olympiad programs.

What is a

It is a scientific competition in mathematics, science, physics, chemistry, biology, and informatics.

Implementing agency for Mawhoob competition

King Abdulaziz & His Companions Foundation for Giftedness and Creativity "Mawhiba", in cooperation with the Ministry of Education.

Target group

Saudi male and female students from grades six to the 10th grade.

Competition stages:

The competition will take place in two stages:

first: It is carried out remotely and the target is to participate in 15,000 students.

II: It is done in writing**** for students nominated from the first stage at the headquarters specified by the education departments to which the students are affiliated. (Exceptionally done this year remotely as well).

Competition

1- Pushing the educational field towards more efforts to develop mathematics and science education.

2- Discover the distinguished elements of our male and female students at an early stage to develop their capabilities.

3- Discovering distinguished teachers interested in the field of work on Olympic problems.

4- Spreading the culture of the Olympiad.

5- Raising the spirit of competition between the elements of the educational process.

Competition

The competition targets male and female students who have a passion for the scientific disciplines below, according to the following criteria:

1. The student must be a Saudi national.
2. The student must register in one scientific major only.
3. The student must register in the required specialization according to his grade, provided that the student is in one of the following grades at the beginning of the school year 1442H

Class	Subject					
	Mathematics.	Science	Physics	Chemistry	Biology	Informatics
6th Grade	✓	✓				
7th Grade	✓	✓				✓
8th Grade			✓	✓	✓	✓
9th Grade			✓	✓	✓	✓
10th Grade						✓

4. Complete the competition in its two phases.

Test Instructions

1. The only reference to the subjects of the competition is the mathematics and science syllabus from the Ministry of Education.
2. The student can access the system and take the pilot test directly after receiving the account activation message from the e-learning management system on the e-mail registered in the portal.
3. The test duration is 90 min only.
4. The calculator is allowed to be used in all stages of the competition except for mathematics majors.

(You can use the guide for the competition on our website to obtain samples of questions for each major)

The schedule for the 2020 talent competition

Program	Date		Length in Days	Scientific Disciplines
Register for gifted test	July 8, 2020	September 21, 2020	76	All Specialties
the first stage of Mawhoob test: "Performing an e-test"	September 28, 2020	September 28, 2020	1	Chemistry - Physics - Biology
	September 29, 2020	September 29, 2020	2	Mathematics - Informatics - Sciences
Announcing the results of the first phase	October 1, 2020	October 1, 2020		All Specialties
The second stage of the gifted test: "Performing an e-test"	October 4, 2020	October 4, 2020	2	Chemistry - Physics - Biology
	October 5, 2020	October 5, 2020		Mathematics - Informatics - Sciences
Announcement of phase II results	October 8, 2020	October 8, 2020	1	All Specialties

Exam entry

1. Availability of a computer operating system (Windows or IOS)
2. Connecting the computer device to the internet (making sure that no other device is connected to the network during the testing period to ensure the stability of the connection).
3. Only use Google Chrome (Google Chrome)and make sure that it is updated to the latest version and not to use any other browser to perform the test, including Microsoft Internet Explorer or Microsoft Edge or Safari.
4. Just keep the Google Chrome browser running and make sure that all other programs and windows are closed during the test.

Entry Instructions:

Enter on the link: https://mawhiba.classera.com
Then enter the login data as follows:
1. In the Username field: The email with which the student was registered in Mawhiba portal
2. In the password field: Password sent to you.
3. Click on the blue login button to enter the test

تسجيل الدخول

اسم المستخدم

كلمة المرور

تسجيل الدخول

تسجيل الدخول بحساب موهبة

البريد.الالكتروني الذي تم تسجيل الطالب به في بوابة موهبة

كلمة المرور المرسلة لك.

اضغط هنا للدخول إلى الاختبار

If you encounter difficulty:

What to do if you encounter one of the following problems?

1. Machine restarting problem
2. Close the browser
3. Internet disconnection during the test

We hope that you will follow the steps below to get back for testing

1. Open the browser again and enter the test linkhttps://mawhiba.classera.com
2. Then enter the login data
3. Press the start test button
4. Navigating between the test questions is by clicking on the Previous and Next button located in the top left of the screen, above the question in the Arabic interface, and in the upper right of the screen in the English interface.

Test Delivery

Upon completion of answering the test questions:

1. Click on the Submit button located at the bottom of the screen in the last question in the test.
2. When you click on it and confirm the delivery, the test will end and the result will appear to you, and you will not be able to enter it again.

Competition registration link:

https://www.mawhiba.org/Ar/programs/competitions/mawhoob/Pages/Registration.aspx

Note: The student who does not have an account in Mawhiba is directed to create an account through the link:

https://login.mawhiba.org/Check/RegisterationPage.aspx

And then register for the competition.

Important

1. Mawhiba website has introductory guides for each of the six contest tracks, and each guide contains several experimental questions that explain to the student the type of questions.
https://www.mawhiba.org/Ar/programs/competitions/mawhoob/Pages/library.aspx

2. 1- Ensure that you are connected to the internet before the test date.

3. Verify the test login data (username: the remote mail with which the student is registered in Mawhiba portal and the password that will be sent to you later)

4. 3- Entering the test site 15 min before the test time.

5. Avoid closing the browser during the test.

6. 5- Pay attention to the remaining time for the test.

7. 6- There is only one submission attempt for the test.

8. 7- Avoid clicking the Submit button unless you are sure that all questions have been answered and the test has been completed.

رحلة الطالب مع برنامج موهبة للأولمبيادات الدولية

مسابقة موهوب

فيزياء كيمياء أحياء معلوماتية
الصفوف ٨ و٩ و١٠ (للمعلوماتية فقط)

دورات أساسية

المستوى الأول ٨ و٩
- ملتقى الشتاء
- تدريب الكتروني
- ملتقى الربيع
- تدريب الكتروني
- ملتقى الصيف
- تدريب الكتروني

المستوى الثاني ٩ و١٠
- ملتقى الشتاء
- التدريب المكثف
- ملتقى النخبة
- تدريب الكتروني

المستوى الثالث ١٠ و١١
- ملتقى الشتاء
- التدريب المكثف
- ملتقى النخبة
- تدريب الكتروني

المستوى الرابع ١١ و١٢
- ملتقى الشتاء
- التدريب المكثف

المشاركات الدولية

رياضيات علوم
الصف ٦ و٧

دورات أساسية

المستوى الأول ٦ و٧
- ملتقى الشتاء
- تدريب الكتروني
- ملتقى الربيع
- تدريب الكتروني
- ملتقى الصيف
- تدريب الكتروني

المستوى الثاني ٧ و٨
- ملتقى الشتاء
- التدريب المكثف
- ملتقى النخبة
- تدريب الكتروني

المستوى الثالث ٨ و٩
- ملتقى الشتاء
- التدريب المكثف
- المشاركات الإقليمية
- ملتقى النخبة
- تدريب الكتروني

المستوى الرابع ٩ و١٠
- ملتقى الشتاء
- التدريب المكثف
- ملتقى النخبة

المشاركات الدولية

mawhiba.org
Mawhiba

" موهبة ... حيث تنتمي "

Training exercises

Physics Track
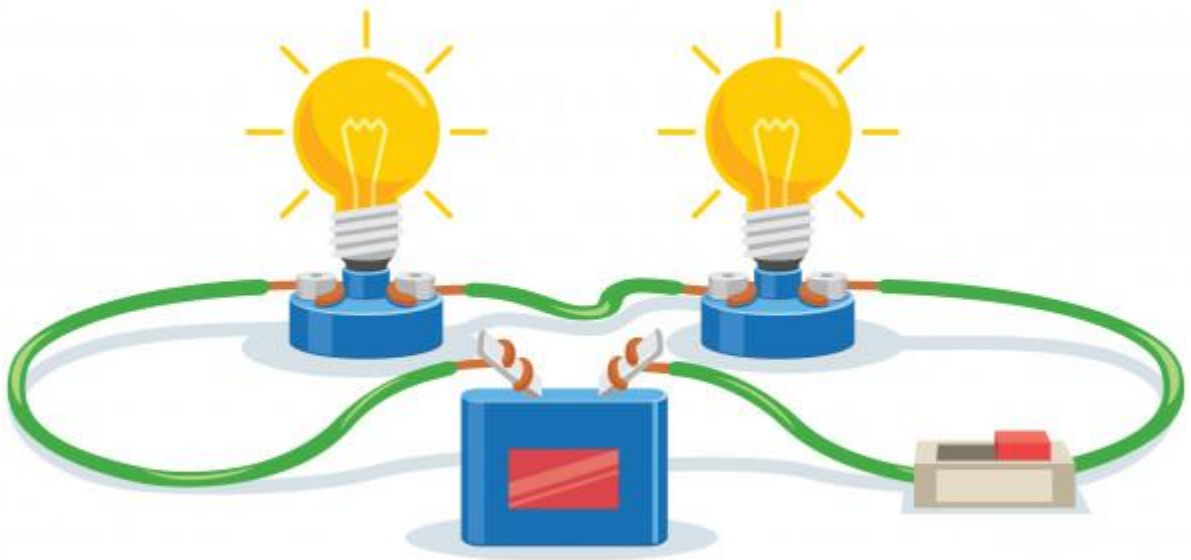
Exercise 1

In a circuit, if the resistance is constant, then the voltage changes to double, the current will be change by:

A) Twice

B) triple

C) Four times

D) Five times

E) Six times

Exercise 2
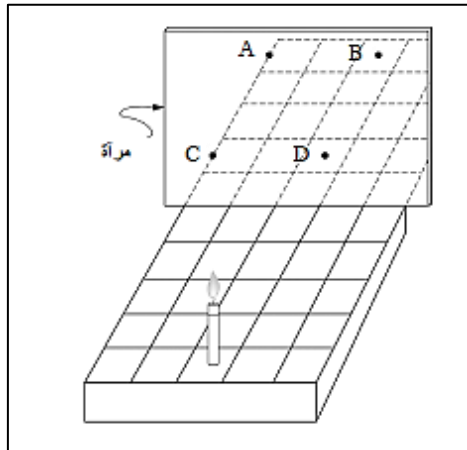
The wavelength shown in the diagram is (in meters):

A) 2

B) 4

C) 8

D) 12

E) 32
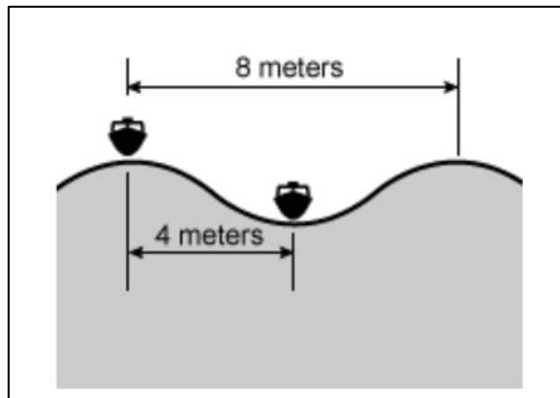
Exercise 3

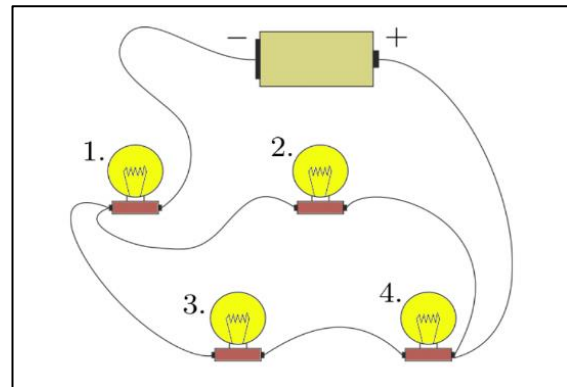**A candle is placed in front of a flat mirror, as in the following figure the point where the candle image is:**

(A) A

(B) B

(C) C

(D) D

(E) B and D

Exercise 4

Four alike bulbs are connected as shown in the *figure* to a battery. Which one is the brightest?

(A) 1

(B) 2

(C) 3

(D) 4

(E) both 3 and 4 are the brightest

Exercise 5

A thermally insulated beaker includes water of temperature 20 □C. If a hot steel ball is put inside the water the temperature is increased to 30 □C. What will be the final temperature of the system if another steel ball (of the same temperature as the first one) is put into the beaker?

A   less than 40^C

B 40^C

C 45^C

D 50^C

E   more than 40^C

Exercise 6

In the middle of a strip of a thin copper plate of size 1 cm × 8 cm, there is a circular hole as shown in the figure. How will the shape of the hole change (if it changes at all) due to thermal expansion if the plate is uniformly heated?

A   it becomes stretched in the horizontal direction

B   it becomes stretched in the vertical direction

C   it shrinks in the horizontal direction

D   the hole remains circular, but its size decreases

E   the hole remains circular, but its size increases
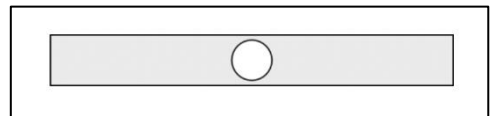
Exercise 7

Two plane mirrors make an angle of 60◻ with each other. A ball is placed between the mirrors as can be seen in the *figure*. How many images are created?

A 2

B 5

C 6

D 11

E 12
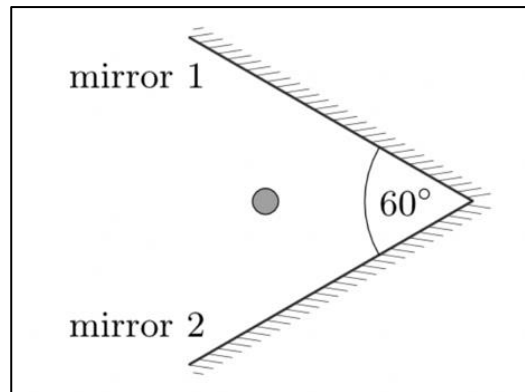
Exercise 8

We are walking at a steady rate, one step in a second. Each step is 1 m long. The rule is the following: one step forward, two steps backward, then three steps forward, four steps backward, five steps forward, six steps backwardو and so on. How far are we from the starting point after one minute (in meters)?

A 30

B 1830

C 0

D 5

E 10

Exercise 9

Two identical bodies of weight 30 N are suspended with the help of three identical dynamometers (devices for force measurement) and two pulleys as shown in the *figure*. What is the reading on the dynamometer in the middle (in Newton)?

A 10

B 20

C 30

D 60

E 90
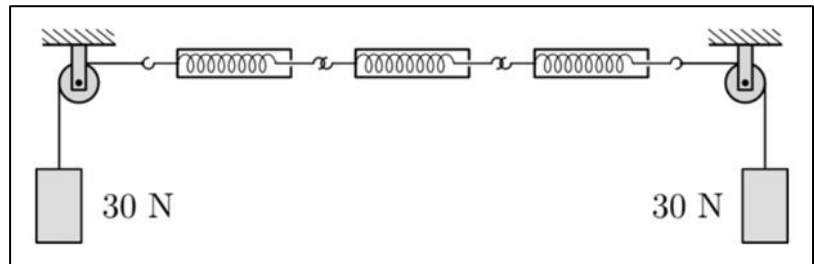
Exercise 10

The 5 m long chain of a small monkey is fastened to the ceiling at height 3 m. The monkey is initially at the fixing point of the chain, the chain is hanging below. By what distance should the monkey come down so that the bottom of the chain reaches the ground (in meters)?

A 0.25

B 0.5

C 1.0

D 1.5

E 2

Exercise 11

In this problem the motion of a small disc sliding along a horizontal frictionless surface of ice is investigated. A column, having a square-shaped cross section, emerges from the ice. The side of the square is 10 cm. The disc is attached to the column by means of a piece of 1.0 m long thread. The top view of the arrangement is shown in the *figure*. The disc is given an initial speed of v=1.0 m/s. What is the length of the trajectory of the disc until the moment when the disc hits the column (in cm)?

A 550

B 628

C 432

D 314

E 864
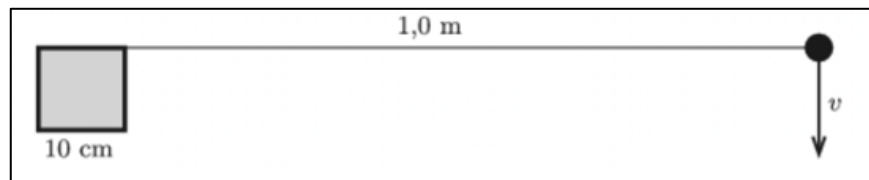
Exercise 12

At the airport there is a moving beltway. If a man stands on the conveyor belt, he reaches from one end to the other end in 60 seconds. If the man walks on the belt in the direction of motion of the belt, he reaches from one end to the other end in 20 seconds. How much time (in seconds) does the man need to reach from one end to the other end if the belt is stopped (i.e. it does not move)?

A 30

B 40

C 50

D 60

E 70

Exercise 13

The following figure shows pictures of a car moving forward taken at regular intervals of time. The acceleration of the car:
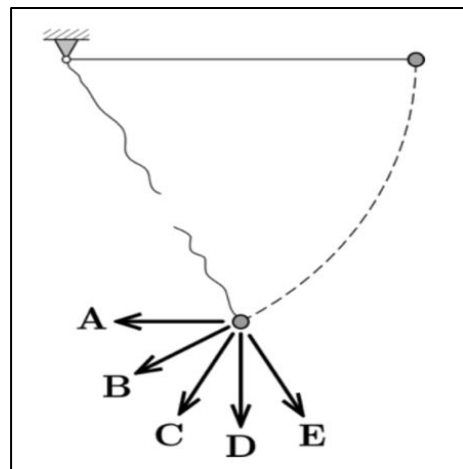
A Zero

B is pointing forwards

C is pointing backwards

D is pointing downwards

E is pointing upwards
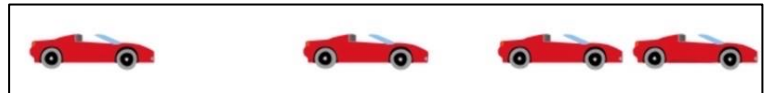
Exercise 14

A pendulum (A ball is tied with a thread) is released from a horizontal position. At a given instant the thread of the pendulum breaks (see the *figure*). In which direction does the bob of the pendulum move immediately after the break?
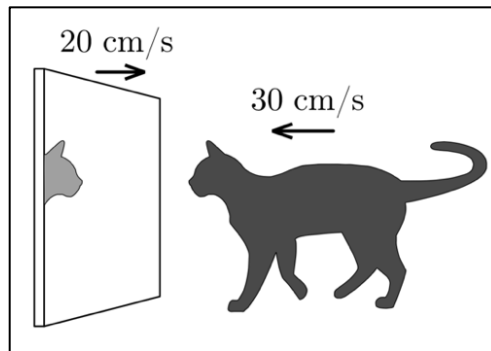
A A

B B

C C

D D

E E

Exercise 15

A cat walks towards a plane mirror with speed 30 cm/s. The mirror is also moving with velocity 20 cm/s towards the cat. At what speed can the cat see its own image coming closer to itself in the mirror? In unit (cm/s)

A   20

B   50

C   60

D   100

E   120

20 cm/s

30 cm/s

Exercise 16

A projectile is thrown up at an angle 60☐ with respect to the horizontal. What can be said about the acceleration of the projectile at the top of its trajectory? (Ignore air drag)

A   the acceleration is zero

B   the acceleration points downwards

C   the acceleration points opposite to the instantaneous velocity

D   the acceleration points in the same direction as the instantaneous velocity

E   the acceleration points at angle $30°$ with respect to the horizontal

Exercise 17

The fuel consumption of a car is 8 litter / 100 km. Which of the following quantities is equal to this quantity?

A 0.08 liter

B 0.00008 m^3

**C** 8 cm

D 0.08mm^2

E 8000 cm3

Exercise 18

It is a known fact that the density of water is the largest at 4$^°$ Celsius. When water is heated from 0$^°$ to 100$^°$, the volume of water:

A Increase gradually

B Decrease gradually

C First increase, then decrease

D First decrease, then increase

E Does not change

Exercise 19

Two burning candles (a narrow and a wide, see the *figure*) are standing on a table at distance 20 cm from each other. Initially the candles are the same height. As the candles are burning, the shadow of the wider candle observed on the wall at distance 40 cm from it does not move at all. The narrow candle burns down in 1 hour. How much time does it take for the wider candle to burn down?

A 40 min

B 1.5 h

C 2 h

D 2.5 h

E 3 h
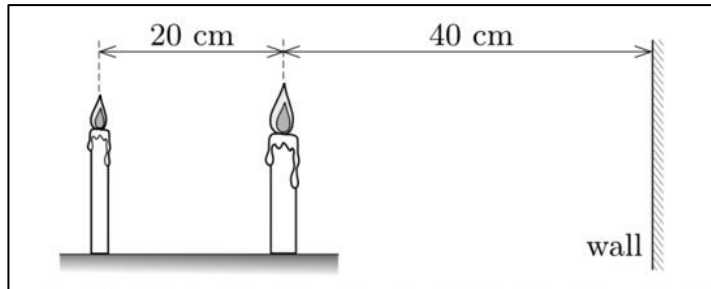
Exercise 20

A wooden boat loaded with stones floats with a captain in the middle of a lake, the captain throws the stones into the lake the water level in the pond slightly.

A Declines

B Rises

C Declines then rises

D Rises then declines

E Stays at the same level

Exercise 21

Road accidents are a major concern to any nation. Momentum is a very crucial parameter when vehicles collide. When comparing the momentum of two moving vehicles, which of the following is correct?

A The vehicle with the higher velocity will have less momentum if the masses are equal.

B The vehicle with a higher mass will have less momentum if its velocity is greater.

C The vehicle with a lower mass will have less momentum if the velocities are the same.

D The vehicle with a larger mass will have less momentum if the velocities are the same.

E The vehicle with a larger mass will have same momentum if the velocities are the same.

Exercise 22

**The picture indicates the use of:**

A Non-renewable energy source for electricity production.

B Solar energy to produce electricity.

C An energy source that produces a large amount of pollution

D Renewable energy source for electricity production

E Fans working on electric power
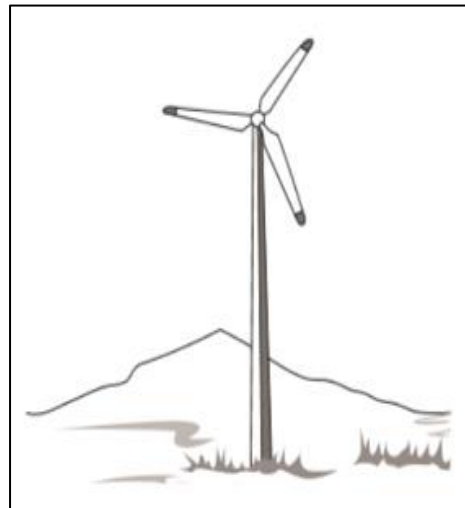
Exercise 23

**In the figure If we affect both vehicles by equal force:**

A The acceleration of cart (1) greater than cart (2)

B The acceleration of cart (2) greater than cart (1)

C Cart (1) and cart (2) have the same acceleration

D The velocity of cart (1) greater than cart (2)

E Cart (1) and cart (2) have the same velocity
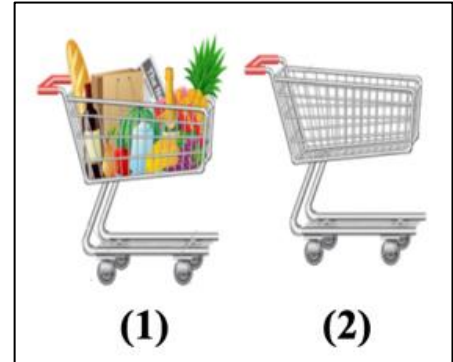
Exercise 24

The figure represents the movement of two objects move along the same line the correct statement is:

A They started the movement at the same moment

B They started the movement from the same point

C They have the same speed

D They move in opposite directions

E They have the same acceleration
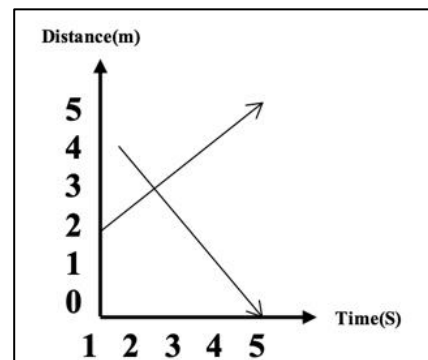
Exercise 25

The lower wedge (see the figure) is moved to the right with constant speed v_1=10 cm/s. What is the speed v_2 of the upper wedge (in cm/s)? The friction is negligible between all contact surfaces.

A 5

B 5.8

C 6.7

D 10

E 17.3
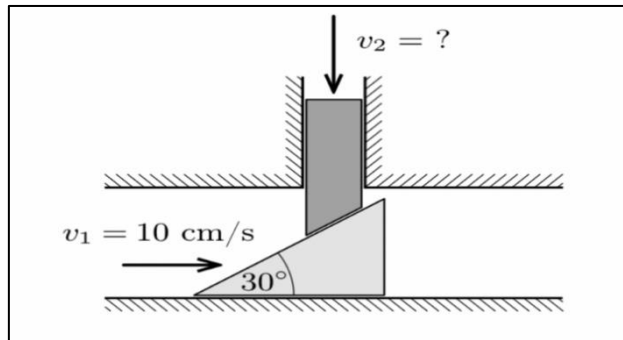
Exercise 26

A spider has fastened one end of a 'super-elastic' silk thread of length 1 m to a vertical wall. A small ladybug is sitting somewhere on the thread. The hungry spider, whilst not moving from its original position, starts pulling in the other end of the thread with uniform speed, v_0=2 cm/s. Meanwhile, the ladybug starts fleeing towards the wall with a uniform speed of 5 mm/s with respect to the moving thread. At most what should be the distance initially between the ladybug and the wall if the bug can reach the wall (in cm)?
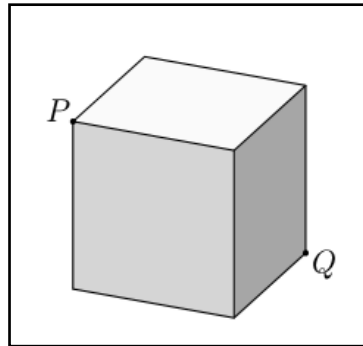
A 10

B 20

C 25

D 30

E 33
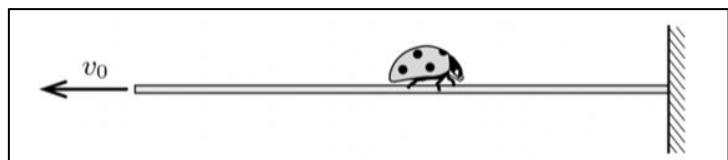
Exercise 27

A small bug starts at vertex P of a solid cube with a side of 10 cm. What is the minimum amount of time (in unit second) that the bugs need to reach the furthest vertex Q from the starting point? The speed of the bug is 1 cm/s.

A 14.14

B 24.14

C 34.14

D 54.14

E 54.14

Exercise 28

A glass of water containing pieces of ice When the ice melts, the water level

A Rises

B Less

C Does not change

D The volume of water increases

E Water density changes

Exercise 29

In the bottom of a glass of water, an ice cube is at rest, inside the ice cube there is a steel ball frozen in (as shown in the *figure*). How does the water level change in the glass when the ice completely melts?
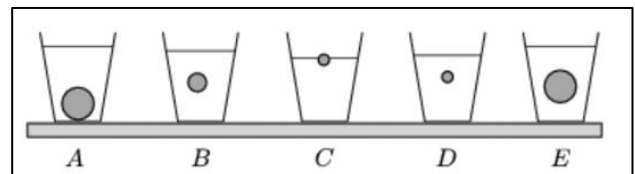
A   the level of water increases.

B   the level of water decreases

C   the level of water does not change

D   the answer depends on the size of the steel ball

E   the answer depends on the size of the ice cube
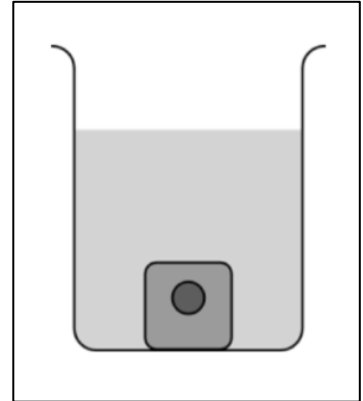
Exercise 30

The same amount of water is poured into five alike glasses. One ball as well was placed into each glass. The radius of each ball is either 1 cm, 2 cm, or 3.5 cm. Then the weight of each glass with the water and the ball in it was measured, and according to their weights, they were placed into an increasing order. Which of the statements is true?

A   glasses A and E have equal weight

B   glasses C and D have equal weight

C   glass E is the heaviest

D   glass D is the lightest

E   glass B is the third in the order

Answer Key

مؤسسة الملك عبدالعزيز ورجاله للموهبة والإبداع
King Abdulaziz & his Companions Foundation for Giftedness & Creativity

Question	Correct Answer
1	A
2	C
3	B
4	A
5	A
6	E
7	B
8	C
9	C
10	C
11	E
12	A
13	C
14	B
15	D
16	B
17	D
18	D
19	B
20	A
21	C
22	D
23	B
24	D
25	B
26	C
27	B
28	C
29	B
30	E

prepared by

Máté Vigh   Talal Mohammed Al-Rashidi

Done