

Indywidualny identyfikator uczestnika konkursu

WOJEWÓDZKI KONKURS PRZEDMIOTOWY   
Z FIZYKI

organizowany przez Łódzkiego Kuratora Oświaty   
dla uczniów szkół podstawowych w roku szkolnym 2023/2024

TEST – ETAP WOJEWÓDZKI

* Na wypełnienie testu masz **120 min**.
* Arkusz liczy **30 stron** i zawiera **50 zadań,** w tym brudnopis.
* Przed rozpoczęciem pracy sprawdź, czy Twój arkusz jest kompletny. Jeżeli zauważysz usterki, zgłoś je Komisji Konkursowej.
* Zadania czytaj uważnie i ze zrozumieniem.
* Odpowiedzi wpisuj długopisem bądź piórem, kolorem czarnym lub niebieskim.
* Dbaj o czytelność pisma i precyzję odpowiedzi.
* W zadaniach zamkniętych zaznacz prawidłową odpowiedź, wstawiając znak X w kwadracie przy właściwej odpowiedzi.
* Jeżeli się pomylisz, błędne zaznaczenie otocz kółkiem i zaznacz znakiem X inną odpowiedź.
* Do każdego numeru zadania podana jest maksymalna liczba punktów możliwa do uzyskania za prawidłową odpowiedź.
* Zapisy w brudnopisie nie będą oceniane.
* Pracuj samodzielnie. Postaraj się udzielić odpowiedzi na wszystkie pytania.
* Korzystaj tylko z przyborów i materiałów określonych w regulaminie konkursu.
* W zadaniach przyjmij wartość przyspieszenia ziemskiego 10 .
* Pamiętaj o rachunku (sprawdzaniu) jednostek wielkości fizycznych.

***Powodzenia***

Maksymalna liczba punktów - 100

Liczba uzyskanych punktów - …..

Imię i nazwisko ucznia: …………………………………………..……………

wypełnia Komisja Konkursowa po zakończeniu sprawdzenia prac

Podpisy członków komisji sprawdzających prace:

1. ………………………………………………….. ……………….……………

(imię i nazwisko) (podpis)

1. ………………………………………………….. ……………….……………

(imię i nazwisko) (podpis)

# Zadanie nr 1

Po sąsiednich i równoległych torach poruszają się dwa pociągi w przeciwne strony. Każdy z nich jedzie z prędkością 80 .   
Dokończ zdanie wybierając poprawną odpowiedź.  
Prędkość jednego pociągu względem drugiego wynosi:

A) 160 . B) 80 . C) 40 . D) 0 .

**……………….../ 1pkt**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 2

Samochód poruszał się ze stałą prędkością 108 . Od chwili uruchomienia hamulców poruszał się on ruchem jednostajnie opóźnionym, z opóźnieniem 1,5 .  
Dokończ zdanie wybierając poprawną odpowiedź.  
Czas po upływie którego samochód zatrzymał się wynosi:

A) 20 s. B) 72 s. C) 20 min. D) 40 min.

**Brudnopis**

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**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 3

Rowerzysta porusza się ze średnią szybkością v1 = 20 , a samochód ze średnią szybkością v2 = 60 .   
Dokończ zdanie wybierając poprawną odpowiedź.

Jeśli rowerzysta pokonuje pewien odcinek drogi w czasie t1 = 30 min., to samochód pokona ten sam odcinek drogi w czasie t2 równym:

A) 5 min. B) 10 min. C) 40 min. D) 90 min.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 4

Dokończ zdanie wybierając poprawną odpowiedź.   
Człowiek pływa w wodzie. Wartość siły wyporu działającej na człowieka, podczas jego wdechu:

A) zmniejsza się.

B) zwiększa się.

C) nie zmienia się.

D) w słodkiej wodzie się zwiększa, w słonej zmniejsza.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 5

Wybierz spośród podanych przykładów nazwę ruchu, jakim porusza się wózek wypełniony wodą, patrząc na sposób ułożenia się w nim wody (rysunek).  
A) Ruch jednostajnie przyspieszony.

B) Ruch jednostajnie opóźniony.

C) Ruch jednostajny.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 6

Wybierz poprawną odpowiedź na poniższe pytanie.  
Czy siły akcji i reakcji wynikające z trzeciej zasady dynamiki równoważą się?

A) Tak, bo mają ten sam kierunek, zwrot i tę samą wartość.

B) Nie, bo są przyłożone do różnych ciał.

C) Tak, ale tylko wtedy, gdy ciała będą na siebie oddziaływać tyle samo czasu.

D) Nie, bo nie znamy przyczyny tych oddziaływań.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 7

Dokończ zdanie wybierając poprawną odpowiedź.   
Kra lodowa o masie 450 kg i gęstości 900 ma objętość:

A) 450 m3. B) 2 m3. C) 0,5 m3. D) m3.

**Brudnopis**

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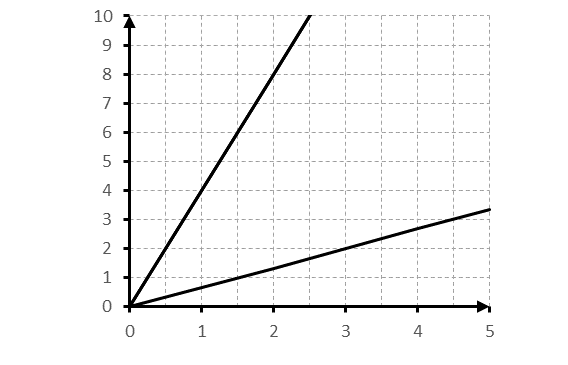
**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 8

Na poniższym wykresie przedstawiono zależności pędów dwóch ciał (I, II)   
od ich prędkości.

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**I**

**II**

Dokończ zdanie wybierając poprawną odpowiedź.  
Na podstawie wykresu można stwierdzić, że

A) masa ciała I jest 6 razy większa od masy ciała II.

B) masa ciała I jest 4 razy mniejsza od masy ciała II.

C) masa ciała I jest 6 razy mniejsza od masy ciała II.

D) masa ciała I jest 4 razy większa od masy ciała II.

**Brudnopis**

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**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 9

Uzupełnij zdanie podkreślając poprawne odpowiedzi podane w nawiasach.  
Jeśli substancjaw temperaturze 273 K, na skutek padającego na nią promieniowania słonecznego zmienia swój stan skupienia to oznacza, że substancja ta jest w stanie (stałym/ciekłym/gazowym) i ulega (parowaniu/topnieniu/krzepnięciu/skraplaniu).

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 10

Dokończ zdanie wybierając poprawną odpowiedź.   
Jeżeli wypadkowa działających na ciało sił jest równa zero albo na ciało nie działają żadne siły, to nieprawdą jest, że:

A. ciało pozostaje w spoczynku.

B. ciało porusza się ruchem jednostajnie przyspieszonym.

C. ciało porusza się ruchem jednostajnym prostoliniowym.

D. ciało pozostaje w spoczynku lub porusza się ruchem jednostajnym   
 prostoliniowym.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 11

Wybierz odpowiedź z poprawnie przeliczonymi jednostkami temperatury.

A. 420C = 242K i 52K = 2290C.

B. 420C = 315K i 52K = 2270C.

C. 420C = 315K i 52K = -2210C.

D. 420C = 305K i 52K = 3250C.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 12

Dokończ zdanie wybierając poprawną odpowiedź.   
Dodanie do wody mydła w płynie:

A. powoduje zwiększenie napięcia powierzchniowego wody.

B. powoduje zmniejszenie napięcia powierzchniowego wody.

C. nie zmienia napięcia powierzchniowego wody.

D. powoduje zmniejszenie objętości wody.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 13

Na poniższym rysunku przedstawiono dwa naczynia (1, 2) o różnych kształtach,   
ale takich samych polach podstawy i takim samym ciężarze, stojące na stole.   
Do obu naczyń wlano taką samą masę wody.

**1**

**2**

Wybierz poprawne stwierdzenie.

A. Ciśnienie hydrostatyczne wody na dno naczynia jest większe w naczyniu 1,   
 ale ciśnienia wywierane przez oba naczynia na stół są jednakowe.

B. Ciśnienie hydrostatyczne wody na dno naczynia jest mniejsze w naczyniu 2   
 i tym samym naczynie to wywiera większe ciśnienie na stół.

C. Ciśnienie hydrostatyczne wody na dno w obu naczyniach jest takie samo   
 i ciśnienia wywierane przez oba naczynia na stół są jednakowe.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 14

Dokończ zdanie wybierając poprawną odpowiedź.   
Ciśnienie sprężonego powietrza w oponie autobusu wynosi 50 kPa. Oznacza to, że:

A. na każdy 1 cm2 powierzchni opony działa siła 50 kPa.

B. na każdy 1 m2 powierzchni opony działa siła 50000 N.

C. na każdy 1 cm2 powierzchni opony działa siła 50 kN.

D. na każdy 1 m2 powierzchni opony działa siła 50 N.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 15

Ryba o ciężarze 30 N utrzymuje się nieruchomo, całkowicie zanurzona w „słodkiej" wodzie jeziora.  
Dokończ zdanie wybierając poprawną odpowiedź.   
Wartość siły wyporu działającej na tę rybę wynosi:

A) 60 N. B) 30 N. C) 6 N. D) 0 N.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 16

W podnośniku hydraulicznym na większy tłok o powierzchni 100 cm2 działa dwukrotnie większa siła niż na tłok mniejszy.   
Dokończ zdanie wybierając poprawną odpowiedź.

Powierzchnia mniejszego tłoka w tym podnośniku wynosi:

A. 25 cm2. B) 50 cm2. C) 150 cm2. D) 200 cm2.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 17

Sześcian po wrzuceniu do wody o gęstości pływa w niej zanurzony   
do swej wysokości.   
Dokończ zdanie wybierając poprawną odpowiedź.

Gęstość substancji, z której wykonany jest sześcian wynosi:

A) . B) . C) . D) .

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 18

Określ (wybierając z podanych odpowiedzi), ile razy ciśnienie hydrostatyczne przy dnie dwumetrowej pionowej rurki całkowicie wypełnionej wodą () jest większe od ciśnienia hydrostatycznego przy dnie takiej samej rurki wypełnionej denaturatem ().

A) 0,8. B) 1,25. C) 2,5. D) 200.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 19

Dokończ zdanie wybierając poprawną odpowiedź.

Ciepło właściwe lodu wynosi .

Aby podnieść temperaturę 0,5 kg lodu o 10C należy mu dostarczyć energii cieplnej   
o wartości:

A) 1050 J. B) 1400 J. C) 2100 J. D) 4200 J.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 20

Dokończ zdanie wybierając poprawną odpowiedź.   
Wysoko w górach zagotowanie wody trwa krócej niż na nizinach. Prawdą jest, że:

A) zagotowanie wody trwa krócej i wrze ona w znacznie niższej temperaturze.

B) zagotowanie wody trwa krócej, a jej niska temperatura ułatwia zaparzenie   
 herbaty.

C) zagotowanie wody trwa krócej i osiąga ona znacznie wyższą temperaturę   
 wrzenia.

D) zagotowanie wody trwa krócej, ponieważ ciśnienie atmosferyczne jest większe   
 niż na nizinach.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 21

Dokończ zdanie wybierając poprawną odpowiedź.

Dwa wahadła o długościach *l* i 2*l* odchylono od pionu na tą samą odległość   
i puszczono swobodnie. Częstotliwość drgań:

A) obu wahadeł będzie taka sama.

B) dłuższego wahadła będzie mniejsza.

C) krótszego wahadła będzie mniejsza.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 22

Dokończ zdanie wybierając poprawną odpowiedź.

Jeśli prędkość kulki wzrośnie 4 razy to jej energia kinetyczna:  
A) zmaleje 16 razy.

B)wzrośnie 4 razy.

C) wzrośnie 16 razy.

D) wzrośnie 2 razy.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 23

Dokończ zdanie wybierając poprawną odpowiedź.

Dźwięk wysoki i głośny to dźwięk o:

A) małej częstotliwości i małej amplitudzie.

B) dużej częstotliwości i dużej amplitudzie.

C) małej częstotliwości i dużej amplitudzie.

D) dużej częstotliwości i małej amplitudzie.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 24

Wybierz przypadek, w którym nie jest wykonywana praca w sensie fizycznym.

A) Satelita krąży wokół Ziemi.

B) Człowiek podnosi w pionie wiadro z wodą.

C) Dziecko przesuwa po podłodze samochodzik – zabawkę.

D) Sportowiec wykonuje okrążenia stadionu.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 25

Silnik spalinowy pewnego pojazdu na cele użyteczne wykorzystuje tylko 40 % energii uzyskiwanej ze spalania paliwa. Pozostała energia ulega rozproszeniu (głównie   
w postaci ciepła). W wyniku spalenia pewnej masy paliwa pojazd uzyskał energię kinetyczną o wartości 800 J.   
Dokończ zdanie wybierając poprawną odpowiedź.  
Całkowita energia, jaka powstała wówczas w wyniku spalenia paliwa, jest równa:

A) 320 J. B) 1200 J. C) 1680 J. D) 2000 J.

**Brudnopis**

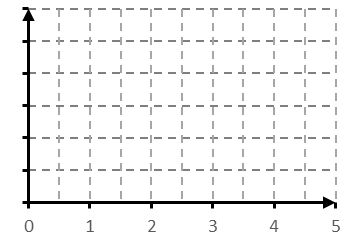
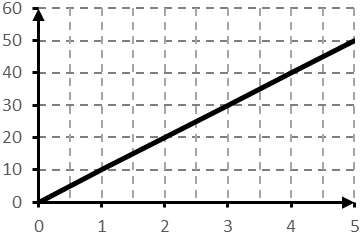
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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 26

Ciało porusza się po linii prostej w tą samą stronę, w którą działa siła. Na podstawie wykresu zależności pracy wykonanej przez siłę od drogi przebytej przez ciało W(s) sporządź wykres zależności siły działającej na ciało od drogi przebytej przez to ciało F(s).



**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 27

Określ (wybierając jedną z poniższych odpowiedzi), jak zmieni się wartość siły elektrostatycznej wzajemnego oddziaływania między naelektryzowanymi ciałami, jeżeli odległość między nimi wzrośnie dwukrotnie.

A) Wartość siły wzrośnie dwukrotnie.

B) Wartość siły zmaleje czterokrotnie.

C) Wartość siły wzrośnie dwukrotnie.

D) Wartość siły wzrośnie czterokrotnie.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 28

Dokończ zdanie wybierając poprawną odpowiedź.

Między dwoma punktami pola elektrycznego istnieje napięcie elektryczne równe   
10 V. Oznacza to, że pole elektryczne, przenosząc ładunek 5 C między tymi punktami, wykonuje pracę równą:

A) 0 J. B) 0,5 J. C) 2 J. D) 50 J.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 29

Dwie identyczne, metalowe kule zawieszone na izolujących niciach naelektryzowano: pierwszą ładunkiem **– 3C**, a drugą ładunkiem **+ 2C**. Następnie kule te zetknięto,   
a potem rozsunięto na taką samą odległość.

Dokończ zdanie wybierając poprawną odpowiedź.

W wyniku opisanego działania wartość siły elektrostatycznej wzajemnego oddziaływania między kulami:

A) wzrosła 3 razy.

B) zmalała 3 razy.

C) zmalała 24 razy.

D) wzrosła 24 razy.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 30

Dokończ zdanie wybierając poprawną odpowiedź.

Długość pewnego przewodnika zwiększono 4 razy i jednocześnie pole jego poprzecznego przekroju zmniejszono 4 razy. Opór elektryczny tego przewodnika   
w wyniku poczynionych zmian:

A) wzrósł 16 razy.

B) zmalał 1 raz.

C) zmalał 16 razy.

D) nie zmienił się.

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 31

Uzupełnij poniższe zdania.

Przedmiot znajduje się na osi optycznej, w odległości 50 cm od soczewki o zdolności skupiającej 4 dioptrie. To oznacza, że obraz tego przedmiotu powstanie w odległości ………… cm od tej soczewki. W tej sytuacji powiększenie otrzymanego obrazu ma wartość ………….

**Brudnopis**

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 32

Dokończ zdanie wybierając poprawną odpowiedź.  
Przed zwierciadłem kulistym wklęsłym o promieniu krzywizny 6 cm ustawiono   
na osi optycznej tego zwierciadła przedmiot w odległości 3 cm od zwierciadła.   
Obraz przedmiotu:

A) jest rzeczywisty, powiększony, odwrócony.

B) jest rzeczywisty, pomniejszony, odwrócony.

C) jest pozorny, powiększony, prosty.

D) nie powstaje.

**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 33

Dokończ zdanie wybierając poprawną odpowiedź.

Obraz otrzymany w zwierciadle płaskim jest:

A) rzeczywisty, tzn. powstał z promieni odbitych od zwierciadła.

B) pozorny, tzn. powstał z przedłużenia promieni padających na zwierciadło.

C) pozorny, tzn. powstał z przedłużenia promieni odbitych od zwierciadła.

D) rzeczywisty, tzn. powstał z promieni padających na zwierciadło.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 34

Dokończ zdanie wybierając poprawną odpowiedź.

Okulary wykonano z soczewek o zdolności skupiającej minus 0,5 dioptrii. Oznacza to, iż:

A) ogniskowa soczewek tych okularów wynosi 20 centymetrów i nosi je   
 dalekowidz.

B) ogniskowa soczewek tych okularów wynosi 2 metry i nosi je krótkowidz.

C) ogniskowa soczewek tych okularów wynosi 50 centymetrów i nosi je   
 dalekowidz.

D) ogniskowa soczewek tych okularów wynosi 0,5 metra i nosi je krótkowidz.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 35

Dokończ zdanie wybierając poprawną odpowiedź.

kąta pomiędzy promieniem padającym, a promieniem odbitym od płaskiego zwierciadła wynosi 600. Kąt pomiędzy promieniem odbitym, a płaszczyzną zwierciadła wynosi:

A) 00. B) 450. C) 600. D) 700.

**Brudnopis**

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**……………….../ 1pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 36

Narciarz zjeżdżając ze stoku w czasie 20 s, osiągnął u jego podnóża prędkość 36 . Oblicz długość stoku, którą przebył narciarz. Opory ruchu pomijamy. Zapisz obliczenia.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 37

Rowerzysta jechał najpierw 4 km na zachód, a następnie na południe. Jego przemieszczenie na całej trasie wyniosło 5 km. Oblicz całkowitą drogę, jaką przebył rowerzysta. Zapisz obliczenia.

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**……………….../ 3pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 38

Wyjaśnij, dlaczego napompowane koło rowerowe jest w każdym miejscu jednakowo twarde.   
Napisz nazwę prawa, które wyjaśnia to zjawisko.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 39

Żelazny klocek o ciężarze 2 N pływa w wodzie. Napisz, jaką wartość ma ciężar wody wypartej przez ten klocek. Odpowiedź uzasadnij.

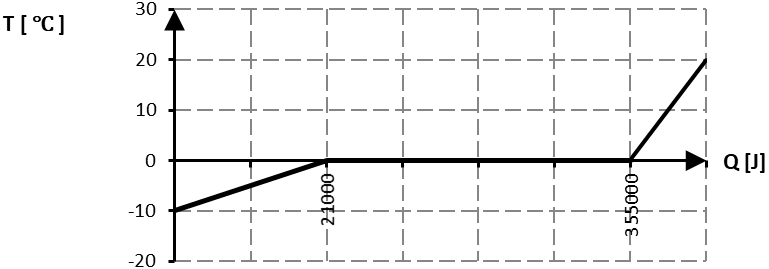
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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 40

Wykres przedstawia zależność temperatury substancji o masie 1 kg   
od dostarczonego ciepła.



**I**

**II**

**III**

Na podstawie wykresu wykonaj poniższe polecenia.

a) Napisz nazwę substancji, której dotyczy przedstawiony wykres.

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b) Napisz nazwy procesów odpowiadających poszczególnym odcinkom przedstawionym na wykresie.

I - ......................................................................

II - ......................................................................

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c) Oblicz wartość ciepła właściwego tej substancji w procesie oznaczonym I. Zapisz obliczenia.

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d) Oblicz wartość ciepła topnienia tej substancji. Zapisz obliczenia.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 41

Odległość między sąsiednimi grzbietami fali wynosi 10 m. Oblicz szybkość, z jaką rozchodzi się fala jeśli uderza ona o brzeg z częstotliwością 0,5 Hz. Zapisz obliczenia.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 42

Oblicz, z jakiej wysokości (licząc od powierzchni ziemi) spadło jabłko o ciężarze 2 N, jeżeli w momencie uderzenia o ziemię miało ono energię kinetyczną równą 20 J. Opór powietrza pomijamy. Zapisz obliczenia.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 43

Wyjaśnij, dlaczego atom jest obojętny elektrycznie.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 44

Piłkarz kopnął nieruchomą piłkę o masie 0,5 kg, która zaczęła poruszać się   
z prędkością 10 . Oblicz pracę, jaką wykonał piłkarz podczas kopnięcia piłki. Opory ruchu pomijamy. Zapisz obliczenia.

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**……………….../ 4pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 45

Czajnik elektryczny o mocy 2000 W jest używany przez 30 minut dziennie. Oblicz koszt energii elektrycznej zużytej do gotowania wody w ciągu miesiąca. Przyjmij,   
że miesiąc ma 30 dni, cena 1 kWh wynosi 0,80 zł oraz, że cała energia elektryczna pobrana z sieci elektrycznej idzie na ogrzanie wody.

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**……………….../ 3pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 46

Przez opornik o oporze R, podłączony do napięcia elektrycznego U płynie prąd elektryczny o natężeniu I. Uzupełnij poniższą tabelkę wpisując brakujące dane.

|  |  |  |  |
| --- | --- | --- | --- |
| U | 6 V | 180 V |  |
| I | 3 mA |  | 6 mA |
| R |  | 3,6 kΩ | 2 kΩ |

**Brudnopis**

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**……………….../ 3pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 47

Dwa oporniki połączono równolegle. Opór zastępczy tego połączenia wynosi R. Wyprowadź wzór, który pozwoli obliczyć opór R1 pierwszego opornika, jeżeli opór elektryczny drugiego opornika wynosi R2.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 48

Prąd, z którego korzystamy w naszych domach jest prądem przemiennym   
o częstotliwości 50 Hz. Oblicz, ile wynosi okres jego zmian oraz określ, ile razy   
w ciągu sekundy prąd ten zmienia kierunek przepływu. Zapisz obliczenia.

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(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 49

Korzystając z poniższych informacji oblicz pole powierzchni, jaką zajmie farma wiatrowa o mocy równoważnej mocy elektrowni Bełchatów oraz porównaj obliczone pole powierzchni farmy wiatrowej z polem powierzchni zajmowanej przez elektrownię Bełchatów.

1. moc elektrowni Bełchatów wynosi 5298 MW;
2. pole powierzchni, jaką zajmuje elektrownia Bełchatów wynosi 18,5 km2;
3. według portalu <https://www.instalacjebudowlane.pl/3535-33-68-elektrownie-wiatrowe--pytania-i-odpowiedzi.html> dla pierwszej turbiny wiatrowej o mocy 2MW wymagana powierzchnia do jej postawienia wynosi 4 ha, a dla każdej kolejnej takiej turbiny 10 ha;
4. według portalu <https://www.cire.pl/artykuly/opinie/130111-jaka-faktycznie-jest-moc-wykorzystania-wiatrakow> typowy średni współczynnik wykorzystania mocy (z uwagi na zmienność prędkości wiatru) zainstalowanej turbiny wiatrowej wynosi 30 % w naszym obszarze klimatycznym;

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**……………….../ 7pkt.**

(liczba uzyskanych punktów / maksymalna liczba punktów)

# Zadanie nr 50

Odległość między Rzeszowem, a Szczecinem wynosi 812 km. Oblicz czas i koszt jazdy zimą z Rzeszowa do Szczecina dla dwóch samochodów poruszających się   
ze średnią szybkością 80 :

1. Samochód 1 - z silnikiem diesla średnio spalającym 6 litrów ropy na 100 km, przy cenie 1 litra ropy wynoszącej 6,60 zł. Przy obliczaniu czasu przejazdu pomiń czas tankowania paliwa na stacji benzynowej.
2. Samochód 2 - elektryczny Renault - Twingo z pełni naładowaną baterią   
   o pojemności 21,3 kWh.

Według danych portalu otoev.pl na jednym pełnym ładowaniu (100 %) samochód ten może przejechać zimą 103 km. Bateria samochodu może być ładowana   
z maksymalną mocą 110 kW.

Z obowiązującego cennika ładowania na stacjach ORLENU wynika,   
że w zależności od źródła zasilania i mocy:

1. ładowanie prądem zmiennym (AC) o mocy 22 kW to koszt   
   1,95 PLN / kWh,
2. ładowanie prądem stałym (DC) o mocy 125 kW to koszt 2,89 PLN / kWh.

Wykonaj obliczenia dla obu źródeł ładowania samochodu elektrycznego i określ, które źródło jest korzystniejsze finansowo.

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