Pieczęć

**Konkurs przedmiotowy z fizyki**

**dla uczniów gimnazjów**

21 marca 2014 r. – zawody III stopnia (finałowe)

# Witamy Cię na trzecim etapie konkursu i życzymy powodzenia.

## Maksymalna liczba punktów – 60. Czas rozwiązywania zadań – 120 minut.

Rozwiązując zadania, przyjmij przybliżone wartości:

* przyspieszenia grawitacyjnego w pobliżu Ziemi –
* ciepła właściwego wody –
* ładunku elementarnego –
* liczby –

**Zadanie 1.**

Uzupełnij tabelę, nazywając podstawowe zjawiska fizyczne „odpowiedzialne” za opisane sytuacje według podanego przykładu.

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| **Lp.** | **Opis zjawiska/sytuacji** | **Nazwa zjawiska** |
| *–* | *Promień światła padający na lustro zmienia kierunek.* | *odbicie światła* |
|  | Promień światła laserowego, przechodząc przez pryzmat, zmienia kierunek. |  |
|  | Po burzy powstaje tęcza. |  |
|  | Widziany z boku obraz łyżeczki, włożonej do szklanki z wodą, składa się z dwóch części. |  |
|  | Obrazy uzyskiwane za pomocą zwierciadeł wypukłych albo wklęsłych są zdeformowane. |   |
|  | Rowerzysta stosujący odblaski zwiększa swoje bezpieczeństwo. |  |

***W zadaniach od 2. do 4. oceń prawdziwość zdań i zaznacz krzyżykiem właściwą odpowiedź.***

**Zadanie 2.**

Wykres przedstawia zależność wartości prędkości turysty podróżującego rowerem od czasu.

**4**  **t (s)**

**6**

**v (m/s)**

1. Przyspieszenie rowerzysty ma wartość . **Prawda 🞎 Fałsz 🞎**
2. W czasie rowerzysta przejechał drogę . **Prawda 🞎 Fałsz 🞎**
3. Koło roweru o średnicy , pokonując drogę , wykonało w przybliżeniu 5 obrotów.

 **Prawda 🞎 Fałsz 🞎**

1. Wszystkie siły działające na turystę równoważą się. **Prawda 🞎 Fałsz 🞎**

**Zadanie 3.**

Gumowa piłka o masie spadła swobodnie z wysokości i po odbiciu od podłoża wzniosła się na wysokość maksymalną . Opory ruchu piłki były tak małe, że można
je pominąć.

1. Czas spadania piłki wynosił . **Prawda 🞎 Fałsz 🞎**
2. Wartość prędkości piłki w chwili uderzenia o podłoże wyniosła . **Prawda 🞎 Fałsz 🞎**
3. Podczas odbicia o podłoże energia kinetyczna piłki zmalała o . **Prawda 🞎 Fałsz 🞎**
4. Całkowita energia układu piłka-otoczenie zmalała. **Prawda 🞎 Fałsz 🞎**

**Zadanie 4.**

W naczyniach A, B i C znajduje się odpowiednio: wody o temperaturze , wody o temperaturze , wody o temperaturze .

1. Średnie energie kinetyczne chaotycznego ruchu cząsteczek w naczyniach A i B są równe. **Prawda 🞎 Fałsz 🞎**
2. Energie wewnętrzne wody w naczyniach A i C są równe. **Prawda 🞎 Fałsz 🞎**
3. Dostarczenie wodzie w naczyniu B ciepła doprowadzi do jej wrzenia. **Prawda 🞎 Fałsz 🞎**

**Zadanie 5.**

Łyżwiarz Zbigniew Bródka, polski panczenista, wywalczył na olimpiadzie w Soczi złoty medal w wyścigu na , pokonując ten dystans w czasie . Mistrz olimpijski
był o lepszy od zawodnika holenderskiego Koena Verweija, zdobywcy srebrnego medalu. Do wyścigów zawodnicy startują parami, a medaliści osiągnęli swoje rezultaty, startując w różnych parach.

1. Oblicz w jednostkach podstawowych układu SI, z dokładnością do pięciu miejsc
po przecinku, średnie wartości prędkości zawodników.

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1. W jednym z portali internetowych podano informację, że gdyby zawodnicy osiągnęli podane wyniki startując w jednej parze, to na finiszu dzieliłaby ich odległość 35 mm. Wykonaj obliczenia i oceń prawdziwość tego stwierdzenia. Załóż, że dojeżdżając do mety, panczeniści poruszali się z prędkościami średnimi obliczonymi w podpunkcie **a** z zadaną dokładnością.

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**Zadanie 6.**

 0 20 40 60 t (s)

v (m/s)

30

20

10

Na prostoliniowym fabrycznym torze testowym Magda i Michał, wyruszając ze wspólnego startu, poddali próbie dwa motocykle.

**A**

Zależności wartości prędkości pojazdów od czasu przedstawiono na wykresie obok.

Michał wyruszył z większym przyspieszeniem.

1. Oblicz różnicę wartości prędkości pojazdów po siedmiu sekundach ruchu.

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1. W punkcie **A** wykresy przecinają się. Co to oznacza?

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1. Jaka odległość dzieliła pojazdy po 60 sekundach od startu?

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1. Oblicz, po jakim czasie od chwili startu Magda wyprzedzi Michała.

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**Zadanie 7.**

Winda o masie , zawieszona na stalowej linie, ruszyła pionowo w górę ze stałym przyspieszeniem o wartości 0. Po sześciu sekundach od chwili rozpoczęcia ruchu zaczęła poruszać się ze stałą prędkością.

1. Oblicz w kN wartość siły, którą lina działa na kabinę windy w pierwszej fazie ruchu.

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1. Z jaką średnią mocą pracuje silnik, przyspieszając windę? W obliczeniach nie uwzględniaj strat energii.

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**Zadanie 8.**

Elektrofor to przyrząd składający się z dwóch płyt (ebonitowej oraz metalowej z przymocowaną do niej rączką wykonaną z izolatora), służący do elektryzowania ciał.

Asia wykonała doświadczenie (patrz: rysunek niżej). Ustawiła na stole dwa elektrycznie obojętne elektroskopy **A** i **B**. Górną część elektroskopu **B** połączyła z Ziemią za pomocą przewodnika. Następnie:

1. do elektroskopu **A** zbliżyła ebonitową płytę elektroforu naładowaną ładunkiem ujemnym;
2. do elektroskopu **B** zbliżyła metalową płytę elektroforu naładowaną ładunkiem dodatnim.

Opisz, jak zachowały się ładunki dodatnie, a jak ładunki ujemne w elektroskopach. Jaki był ich końcowy rozkład? Czy w obu przypadkach listki elektroskopu wychyliły się?

**a.**

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**Zadanie 9.**

Oblicz liczbę ładunków elementarnych, które przepłyną w czasie przez przewodnik,
w którym płynie prąd stały o natężeniu 80.

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**Zadanie 10.**

Rysunek przedstawia oś optyczną z ustawioną na niej soczewką skupiającą, której jedno
z ognisk znajduje się w punkcie **F**. Na osi umieszczono małą świecącą żaróweczkę.
Jej położenie wskazuje punkt **Ż**.

1. Nie wykonując obliczeń, znajdź konstrukcyjnie obraz żarówki otrzymany za pomocą tej soczewki.

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1. Soczewkę skupiającą zastąpiono soczewką rozpraszającą o ogniskowej 50 cm,
a żarówkę umieszczono w odległości 75 cm od niej. Wskaż trzy cechy obrazu otrzymanego za pomocą tej soczewki i podaj jej zdolność skupiającą.

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1. Jaką wadę wzroku można korygować za pomocą soczewki, o której mowa
w podpunkcie **b**? Wyjaśnij dlaczego.

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**Zadanie 11.**

Jacek, zaparzając herbatę w metalowym kubku, stwierdził, że nie cała energia zużywana do zagotowania wody za pomocą grzałki elektrycznej jest wykorzystywana do jej ogrzania. Częściowo jest ona tracona. Zaprojektuj doświadczenie, podczas którego można wykonać niezbędne pomiary, a następnie obliczyć, jaki procent energii wykorzystywany jest w sposób użyteczny. W układzie pomiarowym wykorzystaj: źródło napięcia, dostosowaną do niego grzałkę o nieznanej mocy, woltomierz i amperomierz.

1. Wymień pozostałe pomoce i przyrządy pomiarowe potrzebne do wykonania doświadczenia.
2. Narysuj (naszkicuj) układ doświadczalny.
3. Opisz przebieg doświadczenia i wskaż sposób obliczenia szukanej wielkości.
4. Podaj trzy przyczyny, które mogą spowodować niedokładność otrzymanego wyniku.

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