Hillcrest High School

PHYSICAL SCIENCE P1 memo

Nov 2024

Grade 10

SECTION A (20)

QUESTION 1: MULTIPLE CHOICE **(2 x 10 = 20)**

1.1 C √√
1.2 D √√
1.3 A √√
1.4 B √√
1.5 B √√
1.6 D √√
1.7 C √√
1.8 C √√
1.9 D √√
1.10 B √√

TOTAL SECTION A (20)

SECTION B (100)

QUESTION 2 **(7)**

2.1.1 $f = \frac{Total\ waves}{Total\ time}$ √
$= \frac{2}{3}$
= 0,67 Hz √ (2)

2.1.2 v = f x λ √
v = 0,67 Hz x 0,1m √
v = 0,07 m.s-1 √ (3)

2.2 a = 15 + 10 √

a = 25 mm √ (2)

QUESTION 3 **(6)**

3.1 v = Δx/Δt √
v = 85 / 0,25 or s = 170 / 0,5 √
v = 340 $m.s^{-1}$ or s = 340 $m.s^{-1}$ √ (3)

3.2 v = f x λ √
340 = 100 x λ √
λ = 3,4 m √ (3)

QUESTION 4 **(5)**

4.1 $E = \frac{hc}{\lambda}$ √

$E = \frac{6,63 \times 10^{-34} \times 3 \times 10^{8}}{1 \times 10^{-6}}$ √ √

$E = 1,99 \times 10^{-19}$ J √ (4)

4.2 treatment of cancers / sterilizing instruments √ (1)

QUESTION 5 **(8)**

5.1 series √

Current has only one pathway to flow. √ (2)

5.2.1 $I = V / R$ √

$I = 12 / 3$ √

$I = 4$ A √ (3)

5.2.2 ratio of $B_2 : B_1$

2 : 1

so

2 + 1 = 3 √

then

3Ω / 3 = 1Ω √

so

$B_2 = 2 \times 1\Omega = 2\ \Omega$ √ (3)

QUESTION 6 **(10)**

6.1 $I = V/R$ √

$I = \frac{60}{(20 + 3,75)}$ √ √

I = 2,5263….. A √ (4)

6.2 $V = I \times R$ √

$V = 2,5263\ldots\ldots \times 3,75$ √

V = 9,47V √ (3)

Or Vs = IR

= 2,53(20)

= 50,6 V

Vp = Vt – Vs
= 60 – 50,6
= 9,4V

6.3 $W = I^2Rt$ √
$W = (2,5263....)^2 \times 20 \times (60 \times 2)$ √
W = 15 317,47 J √ (3)

QUESTION 7 **(14)**

7.1 $F = \frac{k Q_1 Q_2}{r^2}$

$10,8 \text{ √} = \frac{9x10^9 \ x \ 4 \ x \ 10^{-6} \ x \ 3 \ x \ 10^{-6}}{r^2}$

r = 0,1 m √ (4)

Remember – the only time to include - minus sign in electrostatics is when calculating **Qnew and Qtransferred**

7.2.1 B to A √ (1)

7.2.2 $Q_{new} = \frac{Q1 + Q2}{2}$ √ (3)

$Q_{new} = \frac{(4 \times 10^{-6} + 3 \times 10^{-6})}{2}$ √

$Q_{new} = 3,5 \times 10^{-6}$ C √

7.2.3 $Q_{trans} = Q_f - Q_i$ √
$Q_{trans} = 3,5 \times 10^{-6} - 4 \times 10^{-6}$ √ (or $3,5 \times 10^{-6} - 3 \times 10^{-6}$)
$Q_{trans} = 5 \times 10^{-7}$ C √

$n_e = Q/q_e$ √

$n_e = \frac{5 \times 10^{-7}}{1,6 \times 10^{-19}}$ √

$n_e = 3,13 \times 10^{12}$ electrons √ (6)

QUESTION 8 **(5)**

Remember to include the direction when a vector is asked – velocity, acceleration and displacement are vectors

8.1 $\Delta x = -500 + 500 + 3000$ √
$\Delta x = 3$ km east √ (2)

8.2 $\Delta v = \Delta x / \Delta t$ √
$\Delta v = 3000 / (90 \times 60)$ √
$\Delta v = 0{,}56$ m.s^{-1} east √

QUESTION 9 **(7)**

Remember to still state the **-2** for the acceleration and then interpret it. You might need to use this accel again and then you **must substitute it as a negative.**

9.1 rate of change of velocity √ (1)

9.2 $v_f^2 = v_i^2 + 2a\Delta x$ √
$0^2 = 20^2 + (2)(a)(100)$ √

$\frac{0^2 - 400}{200} = a$

$a = -2$m.s^{-2}

a = 2m.s^{-2} in opposite direction of original motion √ (3)

9.3 $v_f = v_i + a\Delta t$ √
$0 = 20 + (-2)\Delta t$

$\frac{0 - 20}{-2} = \Delta t$ √

t = 10 s √ (3)

QUESTION 10 **(6)**

10.1 288 x1000 √/ 3600 √ = 80 m.s^{-1} (2)

10.2 No √ (plane needs 1066,66m to come to rest and elephant is 1000m away)

$V_f^2 = v_i^2 + 2a\Delta x$ √

$\frac{0^2 - (80)^2}{2(-3)} = \Delta x$ √

$\Delta x = 1066{,}67$ √ (4)

QUESTION 11 **(19)**

11.1 15 $m.s^{-1}$ √ North √ (2)

11.2 South √ (1)

11.3 stays the same √ (1)

11.4 10 – 3 √ = 7s √ (2)

11.5 Using only the graph (and **NOT** the equations of motion)

11.5.1 A to B : A = ½ b x ht √ and B to C : A = ½ b xht √
A = 0,5 (3)(15) A = 0,5 (2)(10)
A = 22,5m √ A = 10m √

Total distance = 22,5m + 10m = 32,5m √ (5)

11.5.2 22,5m – 10m √ = 12,5m North √ (2)

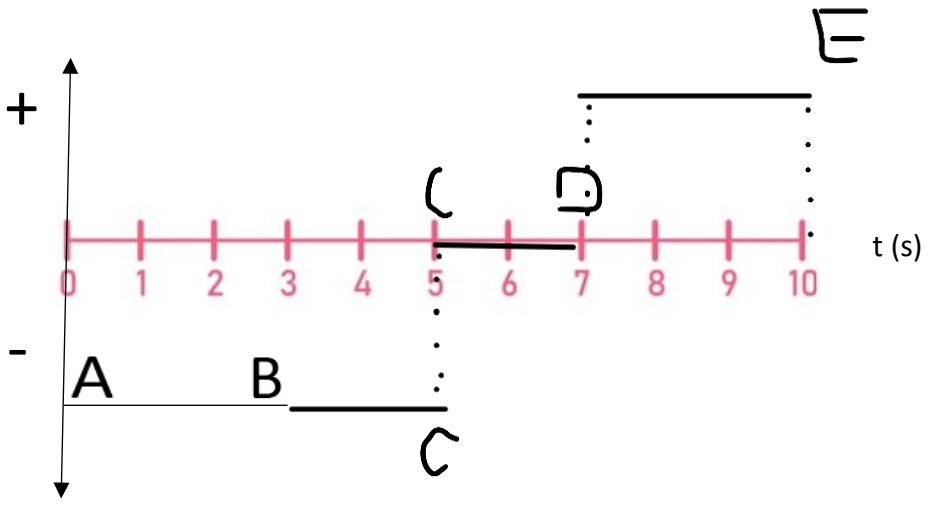
11.5.3 a => $g = \frac{\Delta y}{\Delta x}$

$g = \frac{-10 - 0}{10 - 7}$ √

g = -3,33 √

a = 3.33 $m.s^{-2}$ √ (3)

11.6



(3)

QUESTION 12

$E_k = \frac{1}{2} m v^2$ √

$\frac{312\ 500}{\frac{1}{2}(250)} = v$ √

(3)

V = 50 $m.s^{-1}$ in the direction of motion √

QUESTION 13 **(10)**

13.1 Ep = mgh √
Ep = 2 x 9,8 x 4 √
Ep = 78,4 J √ (3)

13.2 Ep = mgh
Ep = 2 x 9,8 x 1 √
Ep = 19,6 J √ (2)

13.3 Emech top = E mech bottom

Ep + Ek top = Ep + Ek bottom √
mgh + ½ mv^2 = mgh + ½ mv^2
7,84 + (½) (2)$(0)^2$ √ = 19,6 √ + (½) (2) v^2 √

7,84 + 0 = 19,6 + Ek

Ek = 58,8J √ (5)

GRAND TOTAL (120)

EXTENTION QUESTION

Only attempt this question if you are absolutely sure that you have completed questions 1-13.

14.1 24V

14.2 O A (2 x 1)

4.3 $I = V/R$ ✓ $= 4/4$ ✓ $= 1$ A

option 1

(I parallel) :

One branch (4 + 4 = 8 Ω) current is 1 A.

The 16 Ω branch current is 1 A/2 = 0,5 A✓ (dubbel resistance means half the current)

$I_{tot} = I_2 = 1 + 0,5 = 1,5$ A ✓

option 2 v v

$V_p = 2 \times 4 = 8$ V therefore $V(R_1) = 20 - 8 = 12$ V

$I(R_1) = V/R$ ✓

$= 12/8$ ✓

$= 1,5$ A

$1/R_p = 1/R_1 + 1/R_2$ ✓

$= 1/(4+4) + 1/16$ ✓

$= 3/16$

$= 5,33\ \Omega$

or

$R_p = R_1 \times R_2 / R_1 + R_2$ ✓

$= 8 \times 16 / 8 + 16$ ✓

$= 5,33\ \Omega$

$emf = I(R + r)$ ✓

$24 = 1,5[(5,33 + 8) + r]$ ✓m

$24 = 19,995 + 1,5r$

$r = 2,67\ \Omega$ ✓

Option 3:

$I_t = \frac{V_{ext}}{R_t}$ v

$= \frac{20}{13,33}$ v

$= 1,5$A

$R_t = R_s + R_p$ v

$= 5.33 + 8$ v

Option 4:

$V_p = 2 \times 4 = 8$V v

$I_t = \frac{V_p}{R_p}$ v $= \frac{8}{5,33}$ v $= 1,5$A v

OR

$V(int) = Ir$. ✓

$4 = 1,5 \times r$. ✓

$r = 2,67$ ohm ✓ (9)