

Waka's Idle Heroes Lectures

Idle Heroes:

PvP Mechanics

Free-Response Scoring Guidelines

2019 Idle Heroes: PvP Mechanics Free-Response Questions

Idle Heroes: PvP Mechanics

Section I

Time—45 minutes

3 Questions

Directions: Answer all three questions. The suggested time is about 15 minutes for answering each of the questions, which are worth 15 points each. Show all your work and reasoning in this booklet in the spaces provided after each part. **Certain question requires knowledge of hero abilities, you are free to open the game to look them up.**



1. A curious Idler pits a level 100 5-star Iceblink versus a level 80 4-star The Grey-Eyed. The values shown in the hero gallery (pictured above) are the starting in-battle parameters.

(a) Assuming there are no other factors involved, calculate:

i. The Grey-Eyed's Armor Mitigation. (2 points)

| | |
|---|---------|
| For using the correct Armor Mitigation Formula: $A.M. = \text{Armor} / (\text{Level} * 20 + 180)$ Note: 200 instead of 180 in this answer and all following calculations is also acceptable. | 1 point |
| For correctly substituting values: $498 / (80 * 20 + 180) = 0.27977$ | 1 point |

ii. Iceblink's damage dealt in round one. (3 points)

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| | |
|--|---------|
| For using the correct Damage Taken Formula: $D.T. = \text{Attack} * (1 - (\text{Armor Mitigation}) * (1 - \text{Armor Break}))$ | 1 point |
| For correct assumption of Attack being basic in round one. | 1 point |
| For correctly substituting values: $3008 * (1 - 0.27977 * 0.8) = 2334.76$ | 1 point |

(b) Round one is finished after both heroes have attacked. When round two starts, would the damage of Iceblink's second attack be greater than, less than, or equal to the damage of his first attack? (1 point)

____ Greater than ____ Less than ____ Equal to

| | |
|-------------------------------------|---------|
| For correctly choosing Greater than | 1 point |
|-------------------------------------|---------|

Justify your answer. (4 points)

| | |
|--|----------|
| For correct explanation that Iceblink did not have enough energy to use active round 2 (The Grey-Eyed passive) | 2 points |
| For correct explanation that Iceblink's Attack increases from his passive | 1 point |
| For a rough explanation of why $104\% \text{ Attack} > 100\% \text{ Attack}$ | 1 point |

(c) Calculate the damage Iceblink deals in round three. (5 points)

| | |
|--|----------|
| For understanding that there were 2 stacks of Attack% passive present, and for realization that in-battle buffs are additive | 2 points |
| For correct understanding of excess energy being converted into skill damage: $50 + 50 - 20 + 10 + 50 + 10 = 50\% \text{ extra skill damage}$ | 1 point |

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| | |
|--|---------|
| For using the correct Damage Taken Formula: D.T. = Attack * (Skill% + Skill Damage%) * (1 - (Armor Mitigation) * (1 - Armor Break)) | 1 point |
| For correctly substituting values: (3008 * 1.08 * 1.45 * (1 - 0.27977 * 0.8) = 3656.2364 | 1 point |



2. An enthusiastic player is testing their cheese lineup. Among other heroes, it contains a 9-star Emily, a 6-star Destroyer, and a 10-star Aidan. (Relevant information pictured above).

The player decides to use Ice Monster (+11062 Attack, +20% Holy Damage, +10% Precision).

- (a) Assuming the hero gallery stats are the base values, calculate Aidan's starting in-battle Attack. (2 points)

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| | |
|--|---------|
| For understanding that first the additive values are added together, then multiplied by all multiplicative values. (Alternatively, by multiplying monster additive with Aidan's passive) | 1 point |
| For correctly substituting values: $((32147 / 1.3) + 11062) * 1.3 = 46527.6$ | 1 point |

(b) As the fight begins, the enemy team starts attacking first. They perform three attacks, which result in the following:

i. First enemy attack kills Destroyer. Calculate Aidan's attack the moment after Destroyer died. (1 point)

| | |
|---|-----------|
| For realization that Destroyer's and Aidan's passives both buff Aidan | 0.5 point |
| For correctly substituting values: $46527.6 * (1 + 0.15 + 0.36) = 70526.676$ | 0.5 point |

ii. First enemy attack also lowered Emily's HP below 50%. Second enemy attack kills Emily. Calculate Aidan's attack the moment after Emily died. (1 point)

| | |
|---|-----------|
| For realization that Emily's and Aidan's passives both buff Aidan | 0.5 point |
| For correctly substituting values: $46527.6 * (1.51 + 0.29 + 0.36) = 100499.616$ | 0.5 point |

iii. Third enemy attack kills Aidan. Calculate Aidan's on-death passive damage to a Forest hero XYZ, who has 30% Damage Reduce and 35% Armor Mitigation. (4 points)

| | |
|---|----------|
| For correct appliance of Ice Monster HD and Precision stats | 1 points |
|---|----------|

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| | |
|--|-----------|
| For correct realization of Emily's 29% Armor Reduction passive | 1 point |
| For correct appliance of the enemy's Reduce Damage stat | 1 point |
| For using the appropriate Damage Taken formula: $D.T. = ATK * \text{passive\%} * (1 - \text{Damage Reduce}) * (1 - (\text{Armor Mitigation}) * (1 - A.R.) + 0.7 * HD) * (1 + \text{Precision\%} * 0.3)$ | 0.5 point |
| For correctly substituting values: $100499.616 * 4 * 0.7 * (1 - 0.2485 + 0.14) * 1.03 = 258393.1557$ | 0.5 point |

- (c) After a couple of tests, the player equips the previously “artifact-less” Aidan with an artifact which has a single stat: [+90.0% Damage Against Priest]. Assuming the fight goes in a way that is described in question (b), what is Aidan's on-death passive damage to the enemy Ormus, who has 5% Damage Reduce and 35% Armor Mitigation? (6 points)

| | |
|--|-----------|
| For correct realization that Aidan has Faction Advantage over Ormus | 2 points |
| For correct understanding that extra damage to priests is separate multiplier | 1 point |
| For proper use of Faction Advantage (+ 0.3 to DR multiplier), +15% Precision | 1 point |
| For proper use of class damage multiplier | 0.5 point |
| For correct appliance of concepts used in question (b) iii. | 0.5 point |
| For using appropriate Damage Taken formula: $D.T. = ATK * \text{passive\%} * (1 - DR + 0.3) * (1 - (\text{Armor Mitigation}) * (1 - A.R.) + 0.7 * HD) * (1 + \text{Precision\%} * 0.3) * \text{Anti-Class}$ | 0.5 point |
| For correctly substituting values: $D.T. = 100499.616 * 4 * 1.25 * (1 - 0.2485 + 0.14) * 1.075 * 1.9 = 914993.1$ | 0.5 point |

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| | Karim | Horus |
|-------------------|--|---|
| Attack: | 230 000 | 120 000 |
| Current HP: | 3 500 000 | 10 000 000 |
| Armor Mitigation: | -- | 31% |
| Precision: | 0% | -- |
| Block: | -- | 115% |
| Crit Damage: | 30% | -- |
| Armor Break: | 25% | -- |
| Damage Reduce: | -- | 35% |
| 2nd Enable: | Lethal Fightback (When active or basic attack damage enemies with higher current HP than self, deals extra 12% damage.) | Shelter (Decreases Crit Damage received by 15%.) |
| Passive: | Basic Attack deals (130% of Attack) damage, heals self for (45% of the damage dealt) HP. | When blocks an attack, deals [20% of Attacker's Current HP (capped by 1000% of Horus's Attack)] damage against the attacker, heals self for (10% of the damage dealt) HP. |

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3. A person interested in Idle Heroes PvP Mechanics is studying a fight between Karim and Horus. The table above shows in-battle stats for both heroes when Karim attacks Horus with his Basic Attack.

(a) Calculate the damage Horus takes from Karim's Basic attack if:

i. Karim does not crit. (4 points)

| | |
|--|-----------|
| For correct understanding that Lethal Fightback will work | 1 point |
| For correct use of Lethal Fightback multiplier (1.12) | 0.5 point |
| For correct understanding that Horus will block | 0.5 point |
| For correct use of block multiplier (0.7) | 0.5 point |
| For correct use of Karim's passive | 0.5 point |
| For using appropriate Damage Taken formula: D.T. = ATK * passive% * (1 - DR) * (1 - AM * (1 - AB)) * 0.7 * 1.12 | 0.5 point |
| For correctly substituting values: $230000 * 1.3 * 0.65 * (1 - 0.31 * 0.75) * 0.7 * 1.12 = 116944.282$ | 0.5 point |

ii. Karim crits. (6 points)

| | |
|---|-----------|
| For correct use of Crit Multiplier: $1.5 + \text{Crit Damage} * 2$ | 2 points |
| For correct understanding that an additional "crit block" will happen | 1 point |
| For correct use of "crit block" multiplier (0.8) | 0.5 point |
| For correct understanding that Shelter will work | 0.5 point |
| For correct use of Shelter multiplier (0.85) | 0.5 point |
| For using same values as in (a) i. | 0.5 point |
| For using appropriate Damage Taken formula: D.T. = ATK * passive * (1.5 + C.D. * 2) * (1 - DR) * (1 - AM * (1 - AB)) * | 0.5 point |

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| | | |
|--|--|-----------|
| $0.7 * 1.12 * 0.85 * 0.8$ | | |
| For correctly substituting values: $230000 * 1.3 * 2.1 * 0.65 * (1 - 0.31 * 0.75) * 0.7 * 1.12 * 0.85 * 0.8 =$ 166996.434696 | | 0.5 point |

(b) Calculate:

i. The damage Horus deals to Karim when blocking his attack. (3 points)

| | | |
|--|--|-----------|
| For correct understanding that HP% damage is true and does not scale with anything | | 2 points |
| For using appropriate Damage Taken formula: $D.T. = \text{Current HP} * 0.2$ | | 0.5 point |
| For correctly substituting values: $3\ 500\ 000 * 0.2 = 700\ 000$ | | 0.5 point |

ii. Healing done by Karim in (a) ii. and by Horus in (b) i. (2 points)

| | | |
|--|--|-----------|
| For using appropriate Healing formula: $\text{Heal} = \text{damage dealt} * \text{ratio}$ | | 1 point |
| For correctly substituting values (Karim): $166996 * 0.45 = 75148.2$ | | 0.5 point |
| For correctly substituting values (Horus): $700\ 000 * 0.1 = 70000$ | | 0.6 point |

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STOP
END OF SECTION I