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**YEAR 11 ATAR PHYSICS**

**IN-CLASS CASE STUDY – REFRIGERATIVE AIR-CONDITIONING**

1. Write a one page description of a refrigerative air-conditioner, including a clear explanation of its operation in terms of the physics principles involved.
2. How could you modify a refrigerative air-conditioner so that it becomes a reverse cycle air-conditioner (i.e. cools in summer, but heats in winter)?
3. A refrigerator operates on the same principles as an air-conditioner. Describe two main differences in the design of a refrigerator compared to that of an air-conditioner.
4. Fridges and air-conditioners are often called ‘heat pumps’. Explain how this term applies to fridges and air-conditioners.
5. Calculate the efficiency of a 2 kW air-conditioning unit which can cool down an average room from 36 ºC to 23 ºC in 12 minutes. In your calculation assume that the walls of the room, and the air within it, has an average specific heat capacity of 1800 J kg-1 K-1 and a mass of 165 kg that must be heated.
6. Comment on your value for the efficiency of the above air-conditioner and account for its seeming contradiction of the law of energy conservation.