METEOR OBSERVING

For useful meteor observing, you must follow these guidelines:

1. Allow time for your eyes to dark adapt: at least 10 minutes if going out from a lit room to your garden; or at least 5 minutes if you have been driving with car headlights on. See also 2 below.

2. You MUST record the sky limiting magnitude (LM) when you start observing, and at intervals throughout your watch, and right away if there is any significant change, e.g. the Moon rises, or sets, or haze develops or clears, etc. You will find, for example, that although your eyes are fairly well dark-adapted after about 10 minutes, and your L.M. might be 5m.5, after 30 minutes in real darkness your LM will be about 6m.0. You must note this. See NOTES for details of how to do estimate the L.M.

3. You must also record the percentage of sky that is obscured from your observing site by e.g. buildings or trees. Also record any changes that occur, e.g. partial cloud appearing. Note those according to the time that they begin and end.

4. Record the DATE and your actual observing times, i.e. start and end of each watch, to the nearest minute. You may need to take a break because of cloud coming over, or a comfort break, or a t/c, etc. So record the times you start and finish each observing session.

5. If making notes, you MUST use a red torch - anything else will ruin your dark adaptation! Bring a clipboard or some other firm backing, and THREE sharp pencils (they can break....). Use pencils, as some ballpoints won't write if the paper gets damp from dew.

6. If you make a written note of each meteor you see, you must allow for that in calculating the total observing time at the end of each watch: e.g., if you have observed for 50 minutes, and you have recorded 20 meteors, and it takes you 15 seconds to record each one, then you have not been actually observing for a total of 5 minutes, so your total observing time for that session, or 'watch' is 45, not 50, minutes.

7. An alternative is to use a 'dictaphone', so that you can keep observing as you record the details of each one. This is very useful when there are a lot of meteors - in fact even then you may be recording two, or even three, meteors one after the other! Put in a fresh battery, and bring a spare just in case. You don't need to record the EXACT time of each meteor, so you can just check your watch every 15 minutes or so, then estimate elapsed time until the next check. e.g.: "21.02 - Orionid.... 5 minutes [later] Orionid.... 2 minutes, sporadic..." etc. And also bring a pencil & paper, for back-up.

8. Note whether each meteor is a member of the shower you are observing, or a sporadic (or a member of another shower if you know the others well enough!): see 'NOTES'

9. You should attempt to record the following information about each meteor:

    a. maximum brightness, compared with known stars and planets. You will get better at this with practice! See NOTES.

    b. speed: basically 'very fast, fast, medium, slow, or very slow! Again you can only estimate that with experience, but do your best. if only a beginner, just stick to fast, medium or slow.

    c. path length: again a subjective estimate: short, medium or long, or use 'very' as well if you need to.

    d. colour, if any is seen. Normally you won't see any colour in meteors below about mag +2, as the eye is not sensitive enough to colour in fainter objects

    e. Visibility of any 'train': a train is the occasional persistence of visibility of the path of the meteor after 'it' has gone. This can last for anything from about a second up to 15 minutes or so for very bright fireballs. Estimate the duration as well as you can, and also note any changes, e.g. bending or twisting, as the trail gets deformed by high altitude winds.

    f. any fragmentation or flaring along the path.

    g. any sounds such as bangs, or 'hissing', heard at the same time as the meteor. This is a very contentious area of research, as obviously sound from a meteor 50 miles away cannot arrive at the same time as the light! But experienced observers have reported it on very rare occasions (I have heard it once), and it may be due to electrophonic effects, e.g. the ionisation produced by the meteor produces a sound through electrical conduction in something near the observer. For example it has sometimes been reported when the observer is near a wire fence. If you do hear something which might be such a sound, describe the weather, e.g. very damp & misty, and anything relevant in your surroundings, e.g. metal gate, wire fence, etc. But it must be heard within a fraction of a second of the meteor to qualify as a possible effect. Of course, some may be just coincidence - a distant car backfire for example.

OBSERVING HINTS

10. For best results look at a region of the sky which is about 50 degrees above the horizon, and about 40 degrees away from the radiant. (read the literature to see why; it's too complicated to explain here).

11. Look at the darkest region of the sky, e.g. away from any moon, or nearby light.

12. Get comfortable: use a lounger or tilting chair, otherwise you'll get an awfully sore neck!

13. Wrap up REALLY well, especially head, hands & feet. And then add another layer for safety!

14. Take a break every hour or so, to stretch your legs, rest your eyes, have a cup of coffee or hot soup, etc. As noted in (4) above, record the start and end times of each session, between the breaks.

15. You can add other details, e.g. constellation in which seen, passage near a bright star, if you wish, but it's of no real value unless you are experienced & you can record the path accurately, and it only adds to your work load. Record any that are low down, as they will be far away, and dimmed by distance and absorption.

16. Record the location of your observing site, if you are not observing from home!

17. If you use a tape, be careful not to erase any of it as you transcribe the details onto the observing form next day!

If observing in a GROUP, there are two options:

A. Each person observes AS AN INDIVIDUAL, and ONLY records meteors that s/he sees. DO NOT be tempted to record a meteor you didn't see just because somebody beside you saw it. Or -

B. You observe in a group, in a 'GROUP WATCH' each looking at a different area of the sky, (e.g. for 4 people, facing N,S,E & W) with each person calling out the meteors they see, and one other person acting as a recorder, noting down the details, but NOT observing. There's then a formula you apply to correct for overlapping fields of view. I suggest that we don't try to get into that just yet.....

As an example, here's a 'specimen' from one of my observing tape recordings:

"Geminids, 12-13 December 2002. Observing from Big Collin. Clear sky, no obstructions, but 60% gibbous Moon.
Starting observing at 21.10. Limiting Mag 5m.2.
5 minutes; Geminid, mag 2, medium length, medium speed. [i.e. approx time 21.15]
2 minutes; Geminid, mag 3, short, medium speed [i.e. approx time 21.17]
1 minute, Geminid, mag zero, long, medium speed, slight flare at end [ie. approx time 21.18]
3 minutes, sporadic, mag 1, long path, fast. [i.e. approx time 21.21, and so on]
2 minutes, Geminid, mag -2, medium speed & length, yellowish, train lasting 2 secs.
etc
etc
etc
21.40: Limiting magnitude now 5.5.
etc
etc
22.10: 5 minute break, starting again at 22.15.
6 minutes, Geminid, mag 3, short, medium speed
etc
etc
22.50: some cloud, obscuration of sky about 30%.
23.00: sky totally clear again.
23.50, Moon lower, LM = 5.7
Break at 24.00, starting again at 00.10.
00.10: Geminid, mag -3, long, medium speed, double flare near end, train lasted 10 secs.
1 minute: Geminid, mag 4, short, very close to radiant.
etc
etc
01.00. Moon set, LM now 6.0
2 minutes, sporadic, mag 1, very slow, medium length, yellow.
2 minutes, Geminid, mag 4, short, slowish; And another, mag 3, medium, medium.
etc
etc
Finished observing at 01.40. LM still mag 6.0
End of recording of Geminids, 12-13 Dec 2002."

NOTES

RADIANTS
A meteor is defined as being a member of a particular shower if its path, projected backwards, passes within 4 degrees of the defined point of the radiant on a given night. As an approximation, take the separation between the Pointers (Alpha and Beta UMa) as a guide.

Starting with the **Orionids**, the radiant at maximum on Oct 20 is at RA 6h 24m, Dec. + 15 degrees. That's in NE Orion, very close to the border with Gemini. A rough guide is that it's 1/4 of the way from Gamma Geminorum to Lambda Orionis (the brightest star in Orion's 'head'). Or 1/3 of the way from Gamma Gem to Betelgeuse is fairly close....

The Orionid radiant rises about 11 p.m. local (clock) time, and it's worth observing from about midnight onwards, but we won't start to see anything like 'normal' rates until about 02.00, and we won't get close to maximum possible rates from Ireland until about 04.00.

The daily drift of the radiant is +1.2 degrees in RA. As we'll probably only try observing for the night of max + and - a day, (19th - 21st), the radiant drift isn't really significant either. But if anyone wants to try from say Oct 17 - 25, they should allow for that drift.

ESTIMATING METEOR MAGNITUDES: Some useful (approximate!) guides:
- 4 Venus
-2 Jupiter
-1 Sirius
0 Capella, Rigel, Vega, Arcturus, Procyon, Kocab, Betelgeuse
+1 Altair, Aldebaran, Spica, Pollux, Deneb, Regulus = +1.
+2 Polaris, Alpha & Beta UMa (the Pointers), Alpha Cephei, Alpha Persei, Alpha Andromedae, Beta Aurigae, Orion's belt stars.
+3 Albireo, Delta UMa, Beta Canis Minoris, Gamma Aquilae, Delta Cygni
+4 Eta Persei, Nu Persei, Delta Aurigae, Kappa Persei, Beta Aquilae,
+5 Eta UMi (the faintest star in the 'rectangle' of Ursa Minor).

ESTIMATING SKY LIMITING MAGNITUDE: This is one of the hardest parts! There are various ways to do it, none of which is that easy to do accurately!
METHOD 1: You can do 'star counts' in several pre-determined areas of the sky; picking the ones nearest the zenith. You need to know the sky very well, or have a good star atlas, to identify the regions, so I suggest we leave this until people get a bit more experienced.
METHOD 2: You can check to see what's the faintest star visible in the region around Polaris, using the chart in Norton's Star Atlas (p. 24 of latest edition, or look under 'limiting magnitude' in the index)
METHOD 3: If all else fails, count the number of stars you can definitely see within the Square of Pegasus, and/or the 'Kite' of Auriga (Alpha - Beta - Theta - Iota), using whichever is highest up at the time. Pegasus is well up in mid-evening, Auriga is well up later in the night. No need to plot or identify the stars, just count the total WITHIN those areas, ignoring the 'corner' stars. Record that on your report; we'll do the conversion to Limiting Magnitude.

TOO DIFFICULT?

That may all seem a bit intimidating, especially for a beginner! So, to try not to put people off, if you want to have a go, and you have no experience at all, just record:

A. The start and end of your observing times, with any significant breaks

B. The sky brightness, e.g. can you see M31 (Andromeda Galaxy), or M42 in Orion; or is the Milky Way just visible, or easily visible, or really prominent?, etc.

C. Any other significant factors, such as high cloud, partial lower thick cloud, etc.

C. Count the total number of shower meteors, and the total number of sporadics (non-shower meteors).

D. Record any really bright ones, e.g. those brighter than Jupiter or even Venus.

And remember - you'll get a lot better with practice!

N.B. - You may read that a shower has a rate of say 25 per hour (Orionids) or 100 per hour, e.g. Geminids. Those rates are the "Zenithal Hourly Rates (ZHR) - the MAXIMA observable by an experienced observer, at the actual time of Maximum (which might occur during our daylight!), in a very clear dark sky, and with the radiant in the zenith! If the sky is bright, or the radiant low, you will see only a fraction of that rate! SO DON'T BE DISAPPOINTED!

REFERENCE:

Meteors (Philip's Observer's Handbook), by Neil Bone. ISBN: 0-540-01269-6. All you need....

Also useful:

Observing Meteors, Comets, Supernovae & other transient phenomena, by Neil Bone, Springer, ISBN: 1-85233-017-1.

Meteor Showers: A Descriptive Catalog, by Gary W Kronk, Enslow, ISBN: 0-89490-072-2. (quite technical, not much advice on observing)

Norton's Star Atlas - what more does one need to say!?

Good luck,

Terry Moseley